2024 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995 Local Air Quality Management, as amended by the Environment Act 2021

Date: June 2024

Information	Maidstone Borough Details
Local Authority Officer	Dr Stuart Maxwell Delainey Curry
Department	Environmental Health
Address	Maidstone House, King St, Maidstone ME15 6JQ
Telephone	01622602216
E-mail	stuart.maxwell@midkent.gov.uk
Report Reference Number	ASR 2024
Date	June 2024

Executive Summary: Air Quality in Our Area

Air Quality in Maidstone Borough

Breathing in polluted air affects our health and costs the NHS and our society billions of pounds each year. Air pollution is recognised as a contributing factor in the onset of heart disease and cancer and can cause a range of health impacts, including effects on lung function, exacerbation of asthma, increases in hospital admissions and mortality. In the UK, it is estimated that the reduction in healthy life expectancy caused by air pollution is equivalent to 29,000 to 43,000 deaths a year[1].

Air pollution particularly affects the most vulnerable in society, children, the elderly, and those with existing heart and lung conditions. Additionally, people living in less affluent areas are most exposed to dangerous levels of air pollution[2].

Table ES.1 provides a brief explanation of the key pollutants relevant to Local Air Quality Management and the kind of activities they might arise from.

Table ES.1 - Description of Key Pollutants

Pollutant	Description
Nitrogen Dioxide (NO_2)	Nitrogen dioxide is a gas which is generally emitted from high-temperature combustion processes such as road transport or energy generation.
Sulphur Dioxide (SO_2)	Sulphur dioxide (SO_2) is a corrosive gas which is predominantly produced from the combustion of coal or crude oil.
Particulate Matter (PM_{10} and $PM_{2.5}$)	Particulate matter is everything in the air that is not a gas. Particles can come from natural sources such as pollen, as well as human made sources such as smoke from fires, emissions from industry and dust from tyres and brakes. PM_{10} refers to particles under 10 micrometres. Fine particulate matter or $PM_{2.5}$ are particles under 2.5 micrometres.

[1] UK Health Security Agency. Chemical Hazards and Poisons Report, Issue 28, 2022.

[2] Defra. Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006

Maidstone is the county town of Kent. Kent is the most populous County Council area in the Southeast Region. There are currently 1,593,200 people living within the Kent County Council area, according to 2022 mid-year population estimates. The 2022 mid-year population estimate of Maidstone Borough is 180,400 which is expected to increase to 189,800 by 2030.

Around 17,600 new homes are to be provided within the planning period 2011 to 2031. The Borough is home to 11.3 per cent of the population of the Kent County Council area (2022 estimate from KCC website) and borders Swale, Ashford, Tunbridge Wells and Tonbridge and Malling Boroughs, as well as Medway Unitary Authority.

Air quality in Maidstone has been steadily improving in recent years and in previous ASRs we observed that there were no longer any exceedances of any air quality objectives in Maidstone outside of Upper Stone Street. This was confirmed by a detailed assessment carried out by Air Quality Consultants Ltd in 2021. In December of 2022, the Maidstone Town Centre AQMA was formally revoked, and the new, Upper Stone Street AQMA was declared. Therefore, one of our priorities in 2023 has been to develop the Upper Stone Street Air Quality Action Plan. The new AQAP was formally adopted by Maidstone Borough Council's Executive in October 2023.

Figure ES.1 – Upper Stone Street Air Quality Monitoring Station (View to North)

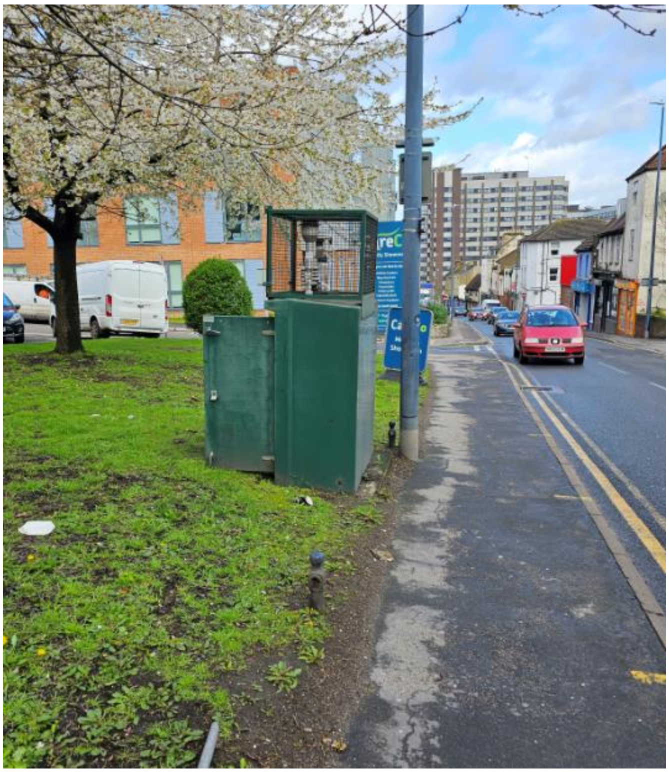


Figure ES.2 – Upper Stone Street Air Quality Monitoring Station (View to South)

2023 was only the second year since 2019 where NO_2 levels were not affected by COVID restrictions. NO_2 levels in 2022 were broadly very similar to those in 2021, and well below

2019 levels. In 2023, NO_2 levels in many places were lower than they were in 2022. Of 32 sites where a comparison was possible, 19 site had lower NO_2 levels in 2023 than they did in 2022. Nine of the sites had the same level of NO_2 in 2023 as they did in 2022, and only 4 sites showed an increase in 2023 compared to 2022.

As would have been expected, having revoked the Maidstone Borough AQMA, there were no exceedances of any objectives outside of the new Upper Stone Street AQMA.

Inside the Upper Stone Street AQMA, we were pleased to see that there was a significant reduction in NO_2 levels. Although significant exceedances of the NO_2 annual mean objective remain there, levels had reduced compared to 2022 at almost every site, and for the first time in many years, no tube in Upper Stone Street recorded an NO_2 annual mean level above 60µgm^{-3}.

Whilst we recognise that air quality improvements in Upper Stone Street still have some way to go, it is interesting to compare the situation in 2023 with that in 2019, immediately pre-pandemic, when four of the five sites in Upper Stone Street recorded levels above 60µgm^{-3}. The highest reading site in Upper Stone Street in 2023 was Maid 96, which recorded an annual mean of 57.8µgm^{-3}, down from 62.5µgm^{-3} in 2022. It was also the highest reading site in 2019, only four years previously, when it recorded a level of 75.2µgm^{-3}. Four years before that, in 2015, it recorded a level of 94.8µgm^{-3}. This is a substantial decrease in 8 years, and if the rate were to continue, the whole of Maidstone Borough could be compliant with all air quality objectives in the next four years or so. One site in Upper Stone Street, Maid 123, was slightly below the objective at 38.8µgm^{-3} having only previously been below the objective during the COVID affected years of 2020 and 2021.

The annual mean level of NO_2 recorded by the automatic monitoring station in 2023 was 41µgm^{-3} which was down from 47µgm^{-3} in 2023. The 2019, pre-pandemic level at the automatic monitoring station was 68µgm^{-3}.

Having monitored NO_2 in more than 150 different locations in the Borough, we have previously reported that, outside of Upper Stone Street, the Wheatsheaf public house is probably the only residential property where the annual mean objective for NO_2 is exceeded. However, the Wheatsheaf has been closed for a number of years and there is no longer a residential receptor there.

Since 2019, Maidstone Borough Council has undertaken some additional monitoring on behalf of local Parish Councils who had identified particular areas of concern based on their own local knowledge. This work was continued in 2023, with 3 additional diffusion tubes deployed on behalf of Headcorn Parish Council, to date, this additional monitoring has identified no exceedances of the NO_2 annual mean in these locations.

In 2021, the monitoring results were somewhat influenced by COVID and the lockdowns, primarily in the early part of the year. Of 32 sites where a comparison with 2022 levels was possible in 2023, NO_2 levels were higher in 4, lower in 19, and unchanged in 9 (we are defining unchanged as meaning that the result in 2023 is within ±1μgm^{-3} of the result in 2022).

During 2023, exceedances of the NO_2 annual mean AQS objective were recorded at a total of five non-automatic monitoring sites (down from seven in 2022), all of which have exceeded in previous years. All five sites are located were located within the new Upper Stone Street AQMA, with the exception of Maid 53. The five sites were:

- Maid 53 at The Wheatsheaf Public House.
- Maid 81 at The Pilot on Upper Stone Street;
- Maid 96 at Lashings Sports Club on Upper Stone Street.
- Maid 122 at Papermakers Arms PH, Upper Stone Street
- Maid 128 Triplicate co-location site with continuous monitoring station in Upper Stone Street.

Historically, Maid 53, at the Wheatsheaf Public House, regularly exceeded the NO_2 annual mean objective, however, the objective has been met at the Wheatsheaf since 2020, and furthermore we note that the Wheatsheaf was scheduled for demolition in 2021, to make way for a junction improvement scheme. Whilst the demolition has not yet gone ahead as expected, the Wheatsheaf remains empty and therefore there is no longer a relevant receptor at the property. Site Maid 128, is not representative of relevant exposure, leaving a total of three sites in the Borough where the annual mean NO_2 objective was exceeded at relevant exposure. This was also the case in 2022.

There were four additional sites where the measured NO_2 annual mean level was within 10% of the objective. These sites were

- Maid 116 at Forstal Lane Cottages.
- Maid 123, which is opposite Maid 122 in Upper Stone Street
- Maid 127 at Wrens Cross

- Maid 153 at Len House, Palace Avenue;

All four of these sites were below the objective once distance corrected to the nearest relevant receptor. In 2023, the number of exceeding sites was reduced to five, with Maid 116 and Maid 123 being slightly below the objective. As in 2022, following distance correction, 3 sites remained above the objective, all in Upper Stone Street.

The DTDPT has distance corrected sites Maid128 and Maid 123, because in the site information, we provide the distance to the nearest building (rather than the nearest relevant receptor). In each case, the nearest building is commercial, at least at ground floor level. Neither of these sites was intended to be representative of relevant exposure. Maid 123 is placed immediately opposite Maid 122 and was set up to help us to understand if there were differences in pollution levels on opposite sides of the road. Maid 128 is the triplicate co-location site with our automatic analyser, from which we can calculate our bias correction factors. Whilst the sites are not themselves representative of relevant exposure, there is relevant exposure quite nearby, which is at a similar distance from the road. We therefore note that distance correcting these sites might be misleading.

No new sources of emissions were identified in 2023.

In previous years we have observed that NO_2 levels for sites on the Eastern (left) side of Upper Stone Street tend to be significantly higher than those on the Western (right) side. There are most likely a number of factors for this, including the prevailing wind direction, the fact that the buildings to the East (left) tend to be taller, and the fact the buildings to the West (right) side are set further back with more frequent gaps compared to those on the East

The annual mean for sites on the Western (right) side of Upper Stone Street are demonstrated in Table ES.1.

Table ES.2 – Comments on Site Locations on Western (right) Side of Upper Stone Street

Measurement Site	NO_2 Annual Mean (2023)	Note
Maid 123	38.8 µgm^{-3}	Distance corrected to 27.9 µgm^{-3}
Maid 128	45.5 µgm^{-3}	Triplicate mean, co-located with automatic monitoring station

		(discrepancy with automatic monitoring station reading is a result of using the national bias correction factor).
Automatic Monitoring Station	41 µgm^{-3}	Sited much closer to the road than the receptors. Distance corrected to 28.7 µgm^{-3} at the nearest property, although the property is commercial rather than residential.
Maid 142	33.7 µgm^{-3}	Representative of relevant exposure but 6m from the kerb
Maid 143	30.8 µgm^{-3}	Representative of relevant exposure but 9m from the kerb

Maid 142 and 143 are located at the Northern (bottom) end of the Upper Stone Street AQMA, Maid 128 and the Automatic monitoring station are situated towards the middle, and Maid 123 is near the top. We therefore have a good spread of monitoring, and the 2023 results suggest that the Western (right) side of Upper Stone Street is likely to be compliant with the NO_2 annual mean objective.

Actions to Improve Air Quality

Whilst air quality has improved significantly in recent decades, there are some areas where local action is needed to protect people and the environment from the effects of air pollution.

The Environmental Improvement Plan[3] sets out actions that will drive continued improvements to air quality and to meet the new national interim and long-term targets for fine particulate matter ($PM_{2.5}$), the pollutant of most harmful to human health. The Air

[3] Defra. Environmental Improvement Plan 2023, January 2023

Quality Strategy[4] provides more information on local authorities' responsibilities to work towards these new targets and reduce fine particulate matter in their areas.

The Road to Zero[5] details the Government's approach to reduce exhaust emissions from road transport through a number of mechanisms, in balance with the needs of the local community. This is extremely important given that cars are the most popular mode of personal travel, and the majority of Air Quality Management Areas (AQMAs) are designated due to elevated concentrations heavily influenced by transport emissions.

Our priority in 2023 was to produce a new Air Quality Action Plan for the new Upper Stone Street AQMA which was declared in December 2022. We completed a consultation on a series of proposed actions in January 2023, and these were incorporated into a full draft action plan document which was approved by Maidstone's Executive in September 2023, before being finalised and published in December 2023.

The most important action in the new Action Plan is to try to secure improvements to Maidstone's bus fleet. The modelling on which the Upper Stone Street AQMA was based suggested that a significant reduction in receptors experiencing an annual mean NO_2 level above $40\mu gm^{-3}$ relative to a 2019 baseline scenario if the bus fleet in Maidstone could be upgraded to 100% Euro VI. Although a bus fleet of 100% Euro VI remains an elusive goal, Maidstone's bus fleet has improved massively since 2019. In 2019 31.4% of the bus fleet was Euro III and a further 20% was Euro IV. By the end of 2023, Euro III and Euro IV buses combined accounted for a total of 8.2% of the bus fleet, with 53.1% being Euro VI and the remainder Euro V. The total number of buses in service has reduced from 70 to 49. Table ES.2 summarises the improvements to the bus fleet to date.

---

[4] Defra. Air Quality Strategy – Framework for Local Authority Delivery, August 2023

[5] DfT. The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy, July 2018

Table ES.3 – Maidstone Bus Fleet Composition

Emissions Standard	2019	2023
Euro 3	22 (31.4%)	4 (8.2%)
Euro 4	14 (20%)	0 (0%)
Euro 5	23 (32.8%)	19 (38.8%)
Euro 6	11 (15.7%)	26 (53.1%)
TOTAL	**70**	**49**

We believe that these improvements in the bus fleet are likely to be a major factor in the improvements in air quality in Upper Stone Street that have occurred in 2023. Our last source apportionment exercise was based on 2019 traffic data, and this showed buses as being responsible for 20.4% of NOx emissions, so we would now expect that figure to have reduced significantly.

Some of the other key actions from the new Action Plan we have been working on in 2023 are :-

Information Campaign to residents of the new AQMA

As part of this action, we plan to introduce some street signs to inform people that they are in an AQMA. Some initial designs for signage have been produced, although a final design has yet to be chosen. Some examples are shown in Figure ES.3

Figure ES.3 – Anti-Idling Signage

Extension to the Clean Air for Schools (CAFS) programme, with emphasis on roll-out of the Pollution Patrol Resource

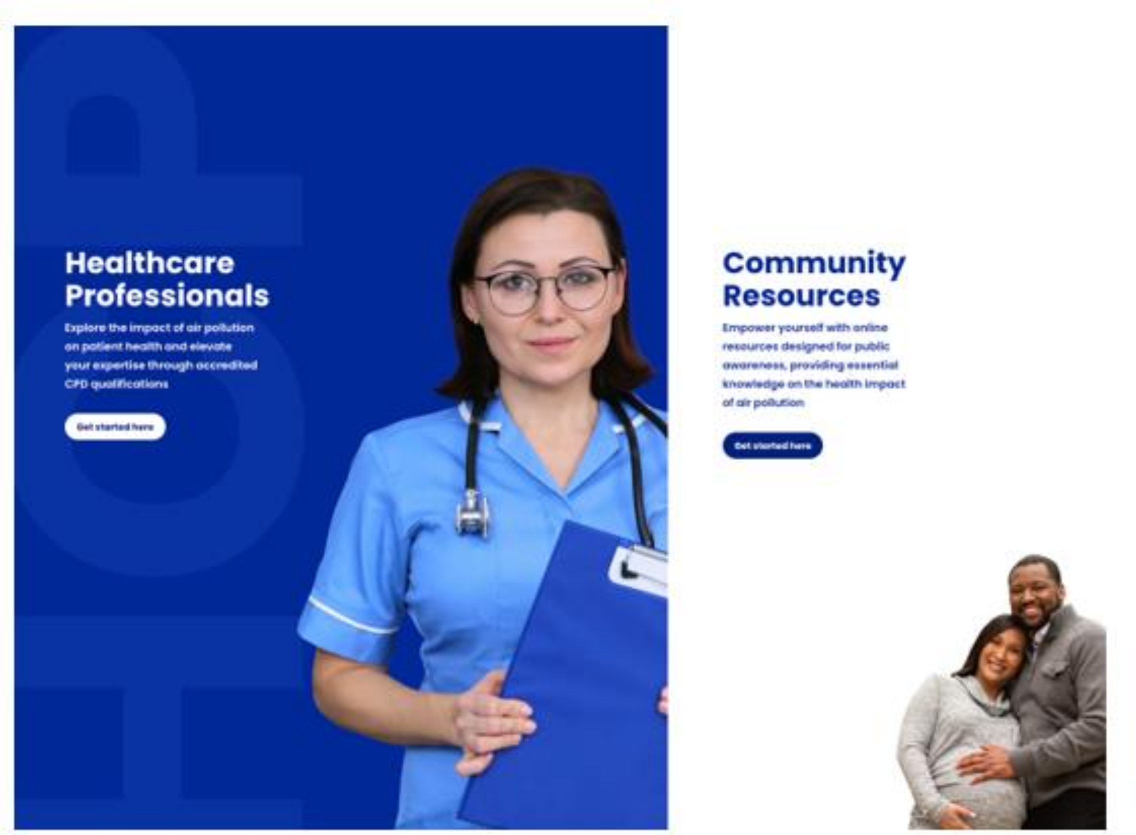
We have been pleased with the Pollution Patrol resource which was developed by TMC Communications Ltd as part of a DEFRA funded project, however, the take up amongst schools has been disappointing, despite several initiatives to promote the project. We are getting towards the end of the DEFRA funding for this project and our focus has been on trying to find a commercial sponsor to continue to develop, maintain and support the project once the DEFRA funding has finished.

Prioritise the AQMA and surrounding areas for roll out of new DEFRA funded Health Professionals AQ resource.

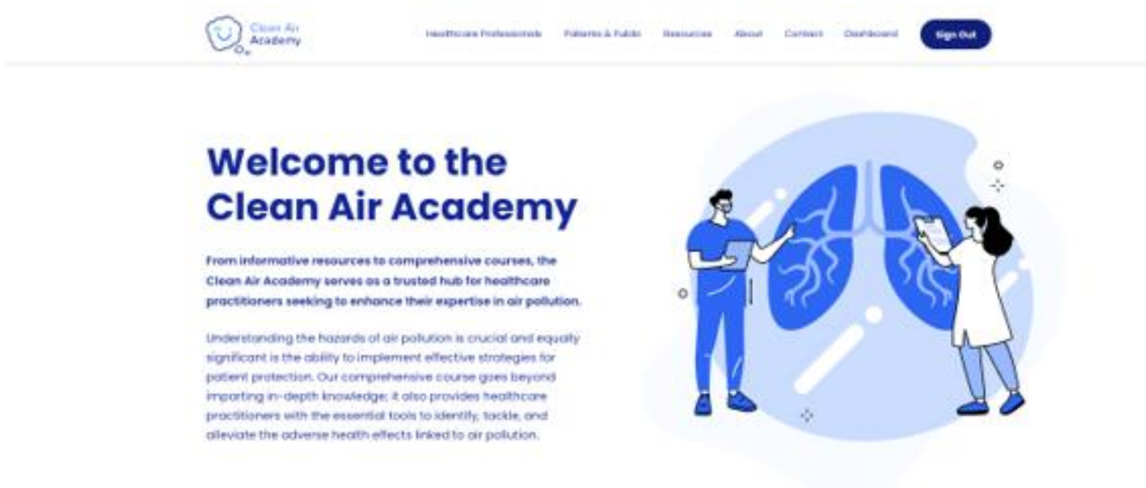
Work on the resource has progressed well during 2023. Some examples of artwork being developed for the project are shown in Figure ES.4

Figure ES.4 – Artwork Developed for DEFRA funded Health Professionals Resource

Home Page



Practitioners Landing Page



A campaign of anti-idling signage across the Borough, focussing on schools and other known or identified problem areas

Two different styles of anti-idling sign have been designed; one for the Mid-Kent shared service (Figure ES.6), and one based on artwork from the Pollution Patrol Project (Figure ES.5). A modest start has been made on deploying these signs with about 20 having been deployed to date, in priority locations near schools.

Figure ES.5 – Pollution Patrol Anti-Idling Signage

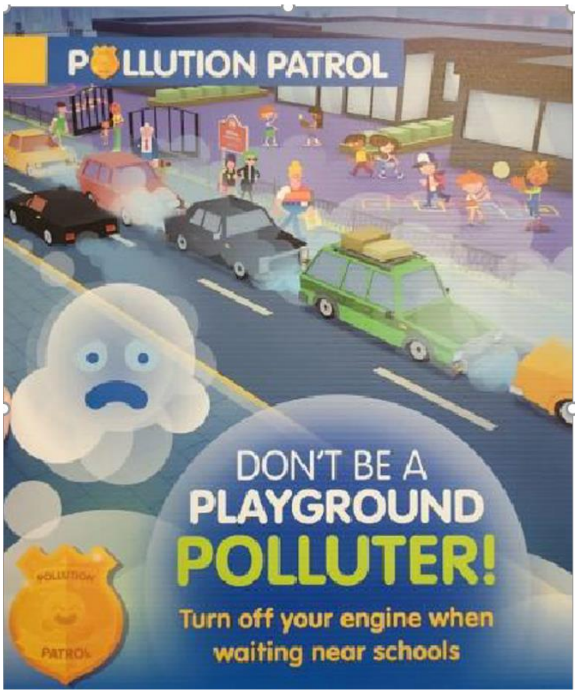


Figure ES.6 – Mid-Kent Shared Service Anti-Idling Signage

Conclusions and Priorities

Air quality in Maidstone continues to improve. 2023 was the second year since 2019 which was unaffected by any COVID restrictions. Our 2023 ASR reported that NO_2 levels in 2022 were similar to those in 2021, which was regarded as rather good news since the early part of 2021 had been impacted by lockdowns. In 2023, however, we were very pleased to see that NO_2 levels in many locations, particularly in Upper Stone Street, were significantly lower than those in 2022.

Of 32 sites where a comparison was possible, 19 site had lower NO_2 levels in 2023 than they did in 2022. Nine of the sites had the same level of NO2 in 2023 as they did in 2022, and only 4 sites showed an increase in 2023 compared to 2022.

As would have been expected, having revoked the Maidstone Borough AQMA, there were no exceedances of any objectives outside of the new Upper Stone Street AQMA.

Inside the Upper Stone Street AQMA, we were pleased to see that there was a significant reduction in NO_2 levels. Although significant exceedances of the NO_2 annual mean objective remain, there, levels had reduced compared to 2022 at almost every site, and for the first time in many years, no tube in Upper Stone Street recorded an NO_2 annual mean level above $60\mu gm^{-3}$. Furthermore, based on the results of tubes Maid 123, Maid 128, Maid 142, Maid 143 and the automatic monitoring station, the Western side of the Upper Stone Street AQMA already appears to be compliant with all AQ objectives.

2023 also saw the publication of the new Upper Stone Street AQMA.

Local Engagement and How to get Involved

As the main source of air pollution within Maidstone Borough Council is transport, the easiest way for the public to get involved with helping improving air quality within the area would be to look at alternatives to the way they usually travel.

The following are suggested alternatives to private travel that would contribute to improving the air quality within the Borough:

- Use public transport where available – This reduces the number of private vehicles on the roads thus helping to reduce congestion and air pollution levels;
- Walk or cycle if your journey allows – Choosing to walk or cycle your journey reduces the number of vehicles on the road and regular exercise helps keep people fit and healthy;

- Car/lift sharing – Where a number of individuals are making similar journeys, such as travelling to work or to school, car sharing reduces the number of vehicles on the road and therefore the amount of emissions being released. This is being promoted via travel plans through the workplace and within schools; and
- Alternative fuel / more efficient vehicles – Choosing a vehicle that meets the specific needs of the owner, fully electric, hybrid fuel and more fuel-efficient cars are available, and all have different levels of benefits in reducing the amount of emissions being released. The installation of Electric Vehicle charging points is being promoted through the use of conditions attached to relevant planning permissions, although to some extent this has been superseded by changes to Approved Document S of the Building Regulations 2010, which came into effect on 15th June 2022. These require at least one EV charging point to be installed in almost all new and retrofit properties.

Figure ES.7 – Mid-Kent Shared Service Clean Air For Schools Programme

We have engaged with over 100 primary schools since 2018 across the three boroughs by delivering interactive assemblies, creating a CAFS information section on each local authority website and creating additional teaching material.

In 2021, we were pleased to receive a grant of £104,000 from DEFRA in order to develop a digital educational air quality resource for primary schools. Throughout 2021 we were developing the resource with our partners TMC Strategic Communications Ltd. It was designed to help primary school children learn about air quality in a fun and interactive way. The resource has now become known as the Pollution Patrol, and it went live in April 2022. Tunbridge Wells Borough Council, Maidstone Borough Council and Swale Borough Council are all part of the Mid Kent Environmental Health Service, so they all play a significant part in the development of the resource, and the finished product will be available to schools across the whole of Kent.

The Pollution Patrol is a group of animated cartoon characters, and the school children are able to watch them explore their fictional hometown of Sooting, looking for pollution sources. The Pollution Patrol resource also offers interactive stories, games, and ideas for lessons, and provides educational information to schools and parents as well as children.

Some still images from the resource are presented in Figure ES.8 and Figure ES.9.

To date, the rate at which schools have signed up to the resource has been slower than we would have liked. At the time of writing, approximately 50 schools have registered. A lot of our focus in 2022 has been on encouraging more schools to sign up. This has not only been done through direct engagement, but also through the development of a promotional toolkit, which can be used by Local Authority Comms Teams to raise awareness of the resource. A copy of the toolkit is presented at Appendix H

Figure ES.8 – Still Frame of Pollution Patrol Learning Resource

Figure ES.9 – Still Frame of Pollution Patrol Learning Resource

Following the declaration of the new Upper Stone Street AQMA in December 2022, Maidstone Borough Council undertook a public consultation on potential actions to include in the new Air Quality Action Plan. The consultation ran between 28 November 2022 and 29 January 2023.

The survey was carried out online with a direct email to those on the Council's consultation mailing list. It was also promoted through the Council's social media channels. Paper copies of the survey and alternative formats were available on request. The survey was open to all Maidstone Borough residents aged 18 years and over and visitors to the borough.

Respondents were asked their opinions about the proposed actions for the Air Quality Action Plan and there was opportunity throughout to provide additional comments.

There was a total of 471 responses to the survey and a letter commenting on the proposed actions was received from KCC. A full report on the survey responses is attached at Appendix G.

Local Responsibilities and Commitment

This ASR was prepared by the Environmental Health Department of Maidstone Borough Council with the support and agreement of the following officers and departments:

Dr Stuart Maxwell – Mid Kent Environmental Services

Delainey Curry – Mid Kent Environmental Services

Kelly Shew – Mid Kent GIS Team

Timings preclude our ASRs being approved by Councillors prior to submission to DEFRA.

This ASR has been signed off by a Director of Public Health with the following comment, *"This ASR has been signed off by the Director of Public Health for Kent with the recognition of its limitations due to the resources Local Authorities have to enforce restrictions and reduce pollution as highlighted by the Association of Directors of Public Health Consultation Response to the National Air Quality Strategy."*

If you have any comments on this ASR, please send them to Dr Stuart Maxwell at:

Maidstone House, King St, Maidstone ME15 6JQ

Telephone 01622 602216

Email stuart.maxwell@midkent.gov.uk

Table of Contents

Figures

Tables

1 Local Air Quality Management

This report provides an overview of air quality in Maidstone Borough during 2023. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995), as amended by the Environment Act (2021), and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in order to achieve and maintain the objectives and the dates by which each measure will be carried out. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by Maidstone Borough Council to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England are presented in Table E.1.

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority should prepare an Air Quality Action Plan (AQAP) within 18 months. The AQAP should specify how air quality targets will be achieved and maintained and provide dates by which measures will be carried out.

A summary of AQMAs declared by Maidstone Borough Council can be found in Table 2.1. The table presents a description of the AQMA that is currently designated within Maidstone Borough. Appendix D: Map(s) of Monitoring Locations and AQMAs provides maps of AQMA and the air quality monitoring locations in relation to the AQMA. The air quality objectives pertinent to the current AQMA designation are as follows:

- NO_2 annual mean

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance: Declaration	Level of Exceedance: Current Year	Number of Years Compliant with Air Quality Objective	Name and Date of AQAP Publication	Web Link to AQAP
Maidstone Upper Stone Street AQMA	Declared 01/12/2022,	Select	The area comprises the stretch of Upper Stone Street between Wrens Cross and old Tovil Road	NO	AQMA declared based on a DA using 2019 data. Level of exceedance in 2019 (Maid 96) was 75.2µgm-3 which had reduced to 62.5 in 2022 when AQMA declared	57.8	Not compliant	Maidstone Borough Council Air Quality Action Plan September 2023	https://www.laqmportal.co.uk/v_rswuploads/report_5/22142_26363_Maidstone%20AQAP%20Final.pdf

☒ **Maidstone Borough Council confirm the information on UK-Air regarding their AQMA(s) is up to date.**

☒ **Maidstone Borough Council confirm that all current AQAPs have been submitted to Defra.**

2.2 Progress and Impact of Measures to address Air Quality in Maidstone Borough

Defra's appraisal of last year's ASR concluded

1. **Maid97 and Maid123 diffusion tube monitoring sites require annualisation. This was not carried out in Table C.1. The data for these two sites needs to be annualised, then bias adjusted, and distance corrected as required.**

   The two sites were borderline candidates for annualisation, depending on whether the percentage data capture was captured in months, as has historically been the case or in weeks. In this case, the front page of the data processing tool was calculating percentage data capture in months and showed the two sites as having 9 out of 12 months, i.e., 75% data capture, and therefore meeting the threshold not to require annualisation. Accordingly, the tool excluded them from the annualisation process. However, subsequently, the tool calculated percentage data capture based on weeks of exposure, which worked out at 73.1%, by which calculation, the tubes did require annualisation. In this particular case, whether or not the tubes were annualised would have an insignificant effect on any air quality considerations in Maidstone: one tube was just over 30µgm^{-3} and is outside the AQMA, and the other was just over 40 which is inside the AQMA. The difference made by annualisation would have been marginal and would have had no practical consequences. We reported the problem with the data processing tool to DEFRA and the problem has since been corrected.

2. The AQMA details provided in Table 2.1 do not match those provided on the portal. The portal does not show the revocation of Maidstone Borough AQMA or the declaration of the Maidstone Upper Stone Street AQMA.

   This has been remedied

3. The trends observed in monitoring data are well presented in multiple graphs which are clear and easy to read, however Figures A.1 and A.4 appear to be identical. Greater discussion of the trends could be included within Section 3 of the report.

4. MBC have included a detailed description of the QA/QC process for the automatic monitoring sites.

5. Additional appendices have been included for the AQMA review from AQC, the consultation for the new AQAP and details of the Pollution Patrol communications plan.

6. There are a few small formatting and consistency errors throughout the report including: the pollutants missing in Table 2.1 for the AQMAs; CM2 PM_{10} concentrations incorrectly bolded in Table A.6; “Error! Reference source not found” present in Appendix C; “(confirm by selecting in box)” present below tables in red text, this should be removed; and in the bias adjustment section, the text states that the local factor was calculated by combining two sites but below Table C.3, the text states that “a single local bias adjustment factor has been used to bias adjust the 2022 diffusion tube results”.
7. The figures showing monitoring locations are clear and it is easy to see where the sites are located. The AQMAs are clearly included and do not affect the ability to read the monitoring locations. A further figure could be created to show the locations of the two automatic monitoring sites.

Maidstone Borough Council has taken forward a number of direct measures during the current reporting year of 2023 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2. Fourteen measures are included within Table 2.2, with the type of measure and the progress Maidstone Borough Council have made during the reporting year of 2023 presented. Where there have been, or continue to be, barriers restricting the implementation of the measure, these are also presented within Table 2.2.

Maidstone Borough Council expects the following measures to be completed over the course of the next reporting year:

Engage with bus service providers to encourage improvement to bus fleet in Maidstone, with special emphasis on services operating on Upper Stone Street

We have been engaging with Arriva, to explore the scope for improving the local bus fleet. Progress has been slow, but this is because Arriva already implemented a large improvement to the bus fleet, as mentioned earlier in this report, so the scope for further improvements is now more limited. However, between 2019 when the traffic survey for the current AQMA modelling was undertaken, and 2023, the percentage of Euro III buses in the fleet reduced from 31.4% to 8.2%, and the percentage of Euro VI buses in the fleet increased from 15.7% to 53.1%, with a reduction in the total number of buses from 70 to 49. believe that these improvements in the bus fleet are likely to have been a major factor in the improvements in air quality in Upper Stone Street that occurred in 2023.

Explore expansion of the additional parking restrictions already introduced on Upper Stone Street to include adjacent roads such as Palace Avenue and Knightrider Street

Extension to the Clean Air for Schools (CAFS) programme, with emphasis on roll-out of the Pollution Patrol Resource.

We continue to engage with schools whenever opportunities arise, and we also continue to encourage them to sign up to use the Pollution Patrol Resource

Review provision of EV parking in Council car parks

Maidstone Borough Council's priorities for the coming year are:-

In partnership with Tunbridge Wells Borough Council, to find commercial sponsorship for the Pollution Patrol resource to try to ensure that it continues to be available and kept up to date after the DEFRA funding is exhausted.

To continue the development of the Health Care Practitioner's Air Quality Resource, which forms the basis of our latest DEFRA funded project.

Maidstone Borough Council has worked to implement their Action Plan measures in partnership with the following stakeholders during 2023:

- Kent County Council
- Tunbridge Wells Borough Council
- TMC Communications
- Matts Monitors Ltd
- Ricardo PLC
- Air Quality Consultants Ltd

Previous modelling has suggested that compliance with all air quality objectives in the Upper Stone Street AQMA will be achieved by 2028. Based on the monitoring results from 2023, it does appear that the west (right hand) side of the road may already be compliant.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, Maidstone Borough Council anticipates that further additional measures not yet prescribed may be required in subsequent years to achieve compliance and enable the revocation of the Upper Stone Street AQMA. However, we note that Upper Stone Street contains a lot of commercial properties, and much of the property is only residential at first floor, where NO_2 concentrations are lower. In 2020 we had a future baseline scenario modelled which predicted that 27 receptors would exceed the NO2 annual mean objective in 2022 in the absence of any intervention. If the 2019 bus fleet were to be updated to 100% Euro VI, then the modelling predicted that this number would reduce to 15. In both cases, the modelling predicted 3 of the receptors would exceed 60µgm^{-3}. Although the 100% Euro VI bus scenario has not been met, the proportion of Euro VI buses has increased from 15.7% in 2019 to 53.1% in 2023, Therefore the number of receptors currently exceeding the NO_2 annual mean objective is likely to be lower than the baseline scenario of 27, and higher than the predicted Euro VI scenario of 15. However, we note that in 2023, the highest measured level of NO_2 recorded in Upper Stone Street was 57.8µgm^{-3}, therefore it is unlikely that any receptors currently exceed the 60µgm^{-3} threshold.

Because of topographical variations throughout the AQMA, and the fact that some receptors are at first floor level, and some at ground floor level, it will not be straightforward to judge when compliance has been fully achieved, based solely on tube data. Therefore, Maidstone Borough Council anticipates having to update the 2020 modelling at some point in the future.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure Title	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
1	Engage with bus service providers to encourage improvement to bus fleet in Maidstone, with special emphasis on services operating on Upper Stone Street	Vehicle Fleet Efficiency	Promoting Low Emission Public Transport	2023	2028	KCC, MBC, Local Bus Companies	Existing Departmental Budgets	No	Not Funded	< £10k	Implementation	Reduction in Emissions from Bus Fleet	%of Euro 6 Buses in AQMA	NA	Current modelling suggests that this measure will almost halve the number of receptors in the AQMA. We will update this modelling in due course to include an up-to-date look at the overall AQMA, and at when compliance with AQ objectives can be expected. The improvements in Maidstone's bus fleet during 2023 were very significant. The proportion of Euro VI buses increased from 15.7% to 53.1% relative to the 2019 baseline year for the modelling of the AQMA. The proportion of Euro !!! buses decreased from 31.4% to 15.7% during the same period.
2	Explore expansion of the additional parking restrictions already introduced on Upper Stone Street to include adjacent roads such as Palace	Traffic Management	Parking Enforcement on Highway	2023	2028	MBC Parking Team	Existing Departmental Budgets	No	Funded	< £10k	Planning	Improved traffic flow leading to reduced emissions	Additional parking restrictions introduced as appropriate		Not possible to model impact of measure as unquantifiable. Would not be a prudent use of scarce resources that could be better spent on implementation of actions.

Measure No.	Measure Title	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
	Avenue and Knightrider Street														
3	Review of Air Quality Guidance to reflect updated air quality information via Local Plan Review and Design and Sustainability DPD	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	2023	End 2024	MBC EH and Planning Policy	Existing Departmental Budgets	No	Funded	< £10k	Planning	Minimising impact of new development	Local Plan review completed DPD adopted	Local Plan review at advanced stage scheduled to be adopted in late 2023. DPD at rg 19 stage.	Not possible to model impact of measure as do not know the outcome of the policy review is. Can be modelled as the action progresses and options are established for consideration by the appropriate committee
4	Review of Taxi Policy	Promotion of Low Emission Transport	Taxi Licensing Conditions	2023	2028	MBC EH and Planning Policy	Existing Departmental Budgets	No	Funded	< £10k	Planning	Reduced emissions from taxi fleet	Improvement to taxi fleet	NA	Not possible to model impact of measure as do not know the outcome of the policy review is. Can be modelled as the action progresses and options are established for consideration by the appropriate committee
5	Information Campaign to residents of the new AQMA	Public Information	Other	2023	2028	MBC EH	Existing Departmental Budgets	NO	Funded	< £10k	Planning	Reduction of Emissions from Engine Idling	All residents of AQMA have been provided with relevant information on an ongoing basis	NA	Not possible to model impact of measure as unquantifiable. Would not be a prudent use of scarce resources that could be better spent on implementation of actions.
6	Extension to the Clean Air for Schools (CAFS) programme, with emphasis on roll-out of the Pollution Patrol Resource	Public Information	Via other mechanisms	2023	2028	MBC EH TMC Communications	Existing Departmental Budgets	YES	Funded	< £10k	Implementation	Reduced impact of school traffic	Number of schools signed up to Pollution Patrol in Kent	Approx 50 schools	Not possible to model impact of measure as unquantifiable. Would not be a prudent use of scarce resources that could be better spent on

Measure No.	Measure Title	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
															implementation of actions.
7	Prioritise the AQMA and surrounding areas for roll out of new DEFRA funded Health Professionals AQ resource.	Public Information	Via other mechanisms	2018	2028	MBC EH TMC Communications Global Action Plan	Existing Departmental Budgets			< £10k	Planning	N/A	Number of health care professionals using the resource	Procurement nearing completion	Not possible to model impact of measure as unquantifiable. Would not be a prudent use of scarce resources that could be better spent on implementation of actions.
8	A campaign of anti-idling signage across the Borough, focussing on schools and other known or identified problem areas	Public Information	Via other mechanisms	2018	2028	MBC EH	Existing Departmental Budgets	No		< £10k	Implementation	Reduction of Emissions from Engine Idling	Number of anti-idling signs installed	Approx 20 signs in identified hot spots	Not possible to model impact of measure as unquantifiable. Would not be a prudent use of scarce resources that could be better spent on implementation of actions.
9	Consider discount on resident's parking for EV vehicles.	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	2018	2028	MBC Parking Team	Existing Departmental Budgets	No	Funded	< £10k	Implementation	Reduction in Emissions from diesel and petrol vehicles	Council decision on giving discount made	NA	Not possible to model impact of measure as unquantifiable. Would not be a prudent use of scarce resources that could be better spent on implementation of actions.
10	Review provision of EV parking in Council car parks	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	2018	2028	MBC Parking Team	Existing Departmental Budgets	No	Funded	< £10k	Implementation	Reduction in Emissions from diesel and petrol vehicles	Amount of alternative refuelling provision	NA	Currently provision exceeds demand however this will be kept under review as demand increases.
11	Continuation of MBC sponsorship of the Walk on	Public Information	Via other mechanisms	2018	2028	MBC EH	Existing Departmental Budgets	No	Funded	< £10k	Implementation	reduction in emissions from school traffic	Sponsorship continued for life of action plan	£2500 given annually to sponsor scheme	Not possible to model impact of measure as unquantifiable. Would not be a prudent use of

Measure No.	Measure Title	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
	Wednesday Scheme														scarce resources that could be better spent on implementation of actions.
12	Work with KCC to ensure that potential for appropriate and beneficial tree planting is completed on Upper Stone Street	NA	NA	2018	2028	MBC EH plus KCC Arboricultural Team	Existing Departmental Budgets	No		< £10k	Implementation	N/A	Number of trees planted	6 trees planted in suitable location	Not possible to model impact of measure as unquantifiable. Would not be a prudent use of scarce resources that could be better spent on implementation of actions.
13	Identify and bid for any grant funding for suitable projects.	NA	NA	2018	2028	MBC EH	Existing Departmental Budgets	No		< £10k	Implementation	N/A	Bid submitted	Currently implementing projects from two successful bids	Impact will depend on the nature of each individual project. Modelling on a bid specific basis in support.
14	Explore the use of new and novel solutions that may to reduce the impact of pollution on Upper Stone Street	NA	NA	2023	2028	MBC EH	Existing Departmental Budgets	No		< £10k	Implementation	N/A	Novel solutions considered as appropriate	One considered to date “roadvent”	Roadvent project considered but difficulties around installation and ongoing operational costs could not be resolved.

2.3 $PM_{2.5}$ – Local Authority Approach to Reducing Emissions and/or Concentrations

As detailed in Policy Guidance LAQM.PG22 (Chapter 8) and the Air Quality Strategy[6], local authorities are expected to work towards reducing emissions and/or concentrations of fine particulate matter ($PM_{2.5}$)). There is clear evidence that $PM_{2.5}$ (particulate matter smaller 2.5 micrometres) has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

New (2022) data from the Public Health Outcomes Framework (indicator D01) indicates that for the fraction of deaths, attributable to $PM_{2.5}$, in Maidstone Borough is 5.8%, which is the same as the figure for England as a whole.

Note that in Maidstone, annual mean $PM_{2.5}$ levels measured in Upper Stone Street, which has the highest levels of pollution in the Borough, reduced to 12µgm^{-3} from 14µgm^{-3} in both 2021 and 2022. We believe that the Covid pandemic may have had some impact on pollution levels in the early part of 2021, but that this was not the case in 2022. The 'pre-Covid' $PM_{2.5}$ level in 2019 was 18µgm^{-3}. The level is required to be below the objective of 12µgm^{-3} by 2028 and 10µgm^{-3} by 2040. Based on the most recent results, we are optimistic that this will be achieved.

LAQM.TG22 Table A1 Action Toolbox provides a list of measures that can be implemented to tackle $PM_{2.5}$, some of these measures are included in our AQAP including anti idling campaigns, encouraging behavioural change (CAFS and via the development of the Pollution Patrol which includes an element on domestic burning) and promotion of cycling and walking. Similar messages are being included in the development of the DEFRA funded Healthcare Practitioner's Resource. We recognised that any measures employed to reduce NO_2 and PM_{10} will also have a beneficial effect on $PM_{2.5}$.

Maidstone Borough Council will also consider the scope for including other relevant measures for reducing $PM_{2.5}$ in the new Air Quality Action Plan being completed in 2023.

---

[6] Defra. Air Quality Strategy – Framework for Local Authority Delivery, August 2023

3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance

This section sets out the monitoring undertaken within 2023 by Maidstone Borough Council and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2019 and 2023 to allow monitoring trends to be identified and discussed.

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

Maidstone Borough Council undertook automatic (continuous) monitoring at 2 sites during 2023. Table A.1 in Appendix A shows the details of the automatic monitoring sites. NB. Local authorities do not have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate there is a problem. The https://www.kentair.org.uk/data page presents automatic monitoring results for Maidstone Borough Council, with automatic monitoring results also available through the UK-Air website.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

3.1.2 Non-Automatic Monitoring Sites

Maidstone Borough Council undertook non- automatic (i.e., passive) monitoring of NO_2 at 38 sites during 2023. Table A.2 in Appendix A presents the details of the non-automatic sites.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on Quality Assurance/Quality Control (QA/QC) for the diffusion tubes, including bias adjustments and any other adjustments applied (e.g., annualisation and/or distance correction), are included in Appendix C.

3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias, annualisation (where the annual mean data capture is below 75% and greater than 25%), and distance correction. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO_2)

Table A.3 and Table A.4 in Appendix A compare the ratified and adjusted monitored NO_2 annual mean concentrations for the past five years with the air quality objective of 40µg/m^3. Note that the concentration data presented represents the concentration at the location of the monitoring site, following the application of bias adjustment and annualisation, as required (i.e., the values are exclusive of any consideration to fall-off with distance adjustment).

For diffusion tubes, the full 2023 dataset of monthly mean values is provided in Appendix B. Note that the concentration data presented in Table B.1 includes distance corrected values, only where relevant.

Table A.5 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past five years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year.

3.2.2 Particulate Matter (PM_{10})

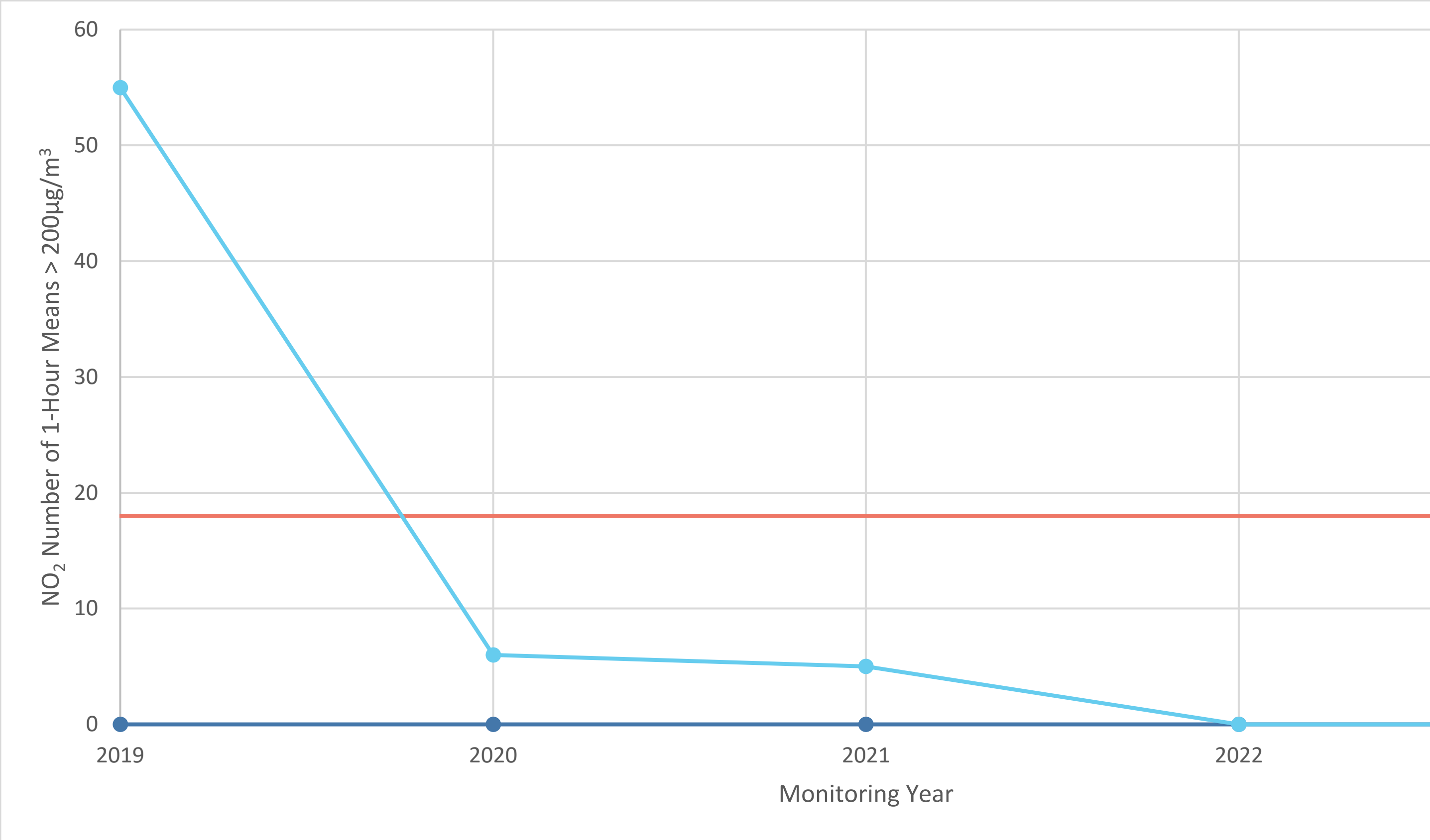


Table A.6 in Appendix A: Monitoring Results compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past five years with the air quality objective of 40µg/m^3. No exceedances of the annual mean objective were measured in 2023.

Table A.7 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the past five years with the air quality objective of 50µg/m^3, not to be exceeded more than 35 times per year. No exceedance of the daily mean objective was recorded in 2023.

3.2.3 Particulate Matter ($PM_{2.5}$)

Table A.8 in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past five years. There appears to be a gradual downward trend in $PM_{2.5}$ levels and the objective is currently being met, with the level having decreased from 18µgm^{-3} to 12µgm^{-3} in that time

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
CM2	Maidstone Rural	Rural	580108	159703	NO2, PM10	NO	Chemiluminescent, FDMS	0	N/A	2
CM3	Upper Stone Street	Roadside	576337	155183	NO2, PM10, PM2.5	YES	Chemiluminescent, BAM	N/A	1.5	1.5

Notes:

(1) 0m if the monitoring site is at a location of exposure (e.g., installed on the façade of a residential property).

(2) N/A if not applicable

Table A.2 – Details of Non-Automatic Monitoring Sites

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
Maid6.1, Maid6.2, Maid6.3	Scragged Oak Lane (AQ monitor, Detling, Maidstone T3	Rural	580101	159695	NO2	No	58.0	50.0	Yes	2.5
Maid19	196 Loose Road, Maidstone	Roadside	576692	153992	NO2	No	0.0	13.3		2.4
Maid45	Mote Park, Maidstone	Urban Background	577410	155166	NO2	No		50.0		2.9
Maid49	454 Tonbridge Road, Maidstone	Roadside	573309	154789	NO2	No	0.0	6.6		2.3
Maid52	565 and 567, Tonbridge Road, Maidstone	Roadside	573349	154790	NO2	No	2.9	2.4		2.7
Maid53	Wheatsheaf PH, Maidstone	Roadside	576724	153948	NO2	No	1.5	1.0		2.4
Maid56	243 Loose Rd, Maidstone	Roadside	576735	154007	NO2	No	0.0	15.1		1.2
Maid63	8 Harbourland Cottages, Maidstone	Roadside	577037	157739	NO2	No	0.0	12.8		1.2
Maid70	On information pole outside kebab hse, 92 King St, Maidstone	Roadside	576469	155710	NO2	No	1.3	1.3		1.9
Maid80	On lamp post by 77B Well Road	Kerbside	576314	156312	NO2	No	4.5	1.0		1.8

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
	and Wheeler St junction									
Maid81	The Pilot pub, Maidstone, Kent	Kerbside	576303	155329	NO2	Yes - Upper Stone Street AQMA	0.0	1.0		1.8
Maid94	53 High Street, Maidstone Seekers River Court	Roadside	575822	155579	NO2	No	0.0	10.0		2.0
Maid96	Lamppost KUBT 512 in bracket for "One Way" sign outside Lashings Sports Club (opposite grassy area) Upper Stone St	Roadside	576346	155183	NO2	Yes - Upper Stone Street AQMA	0.0	1.5		2.0
Maid97	Bracket for "no loading sign" outside ROMNEY house in Romney Place	Roadside	576253	155534	NO2	No	5.0	2.1		2.0
Maid98	Bracket for "no loading sign" outside Miller House in Lower Stone St	Roadside	576258	155422	NO2	No	5.0	3.0		2.0
Maid112	New Cut Rd Turkey Mill Rd sign, Maidstone	Roadside	577770	155613	NO2	No	6.4	2.6		1.5

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
Maid116	On telegraph pole by front garden wall of 36 Forstal Rd Cottages	Roadside	573972	158753	NO2	No	4.3	1.0		1.5
Maid122	Loading sign to the right of the front of Papermakers PH	Roadside	576386	155034	NO2	Yes - Upper Stone Street AQMA	0.0	1.5		1.5
Maid123	Loading sign on opposite side of Upper Stone St to site Maid 122	Roadside	576378	155032	NO2	Yes - Upper Stone Street AQMA	6.9	1.5		2.0
Maid126	Tube located opposite Maid 125 on lamppost adjacent to 5a Hermitage Lane (in addition to Maid 121)	Roadside	573269	155266	NO2	No	3.0	2.6		2.0
Maid127	Tube located in bracket of Give Way sign on opposite side of Wren's Cross to Maid 111	Roadside	576295	155376	NO2	No	2.0	1.5		2.0
Maid128.1, Maid128.2, Maid128.3	Site located in cage for air intake of new urban AQ station in Upper Stone St	Roadside	576337	155183	NO2	Yes - Upper Stone Street AQMA	11.5	1.5	Yes	2.0

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
Maid133	replaces MAID103 on down pipe Ashley Gardens Care centre ME15 8RA	Roadside	578412	152598	NO2	No	0.0	4.6m		2.0
Maid134	1-2 Station Rd East Farleigh on downpipe closed and reopened in 2019	Roadside	573458	153585	NO2	No	0.0	2m		2.0
Maid135	Rockin Robin PH on downpipe from Feb 2019	Roadside	573315	154978	NO2	No	0.0	2m		1.7
Maid140	Co-located with UUN Tesco Express London Road	Roadside	577684	157324	NO2	No	10.0	2.0		1.7
Maid142	Wrens Cross downpipe on Terrace	Roadside	576292	155307	NO2	Yes - Upper Stone Street AQMA	0.0	6.0		1.7
Maid143	Wrens Cross apartments Lower gate post	Roadside	577691	157315	NO2	Yes - Upper Stone Street AQMA	0.0	9.0		1.0
Maid145	College Road, by nursery school	Roadside	575994	155073	NO2	No	0.0	2.5		1.7
Maid147		Roadside	575696	155411	NO2	No	0.0	1.0		2.0
Maid149	Near Swan PH (opposite side of Boughton Lane) Bracket of road	Roadside	576473	153406	NO2	No	6.0	1.0		1.7

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
	sign adjacent Loose Road by 6 Boughton Parade. Replaces Maid 148 due to repeated removal of tubes.									
Maid150	Road sign bracket on pole near nos. 68 & 70 Oakwood Rd. Request of MBC Councillor	Roadside	574678	155408	NO2	No	11.0	1.0		1.7
Maid151	London Rd bracket of sign on lamp post KLCG017 by pedestrian crossing opposite Buckland Hill Road entrance. Request of MBC Councillor	Roadside	575078	155981	NO2	No	24.0	1.0		2.0
Maid152	81A London Road (opposite Leafy Lane) down pipe on Queen's Rd (North) façade of residential dwelling. Request of MBC Councillor	Roadside	574972	156189	NO2	No	0.0	1.0		1.5

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
Maid153	Len House, Palace Avenue ME14 1SN	Roadside	576041	155548	NO2	No	27.0	2.0		1.7
Maid154	New Eclipse Park Care facing M20	Roadside	577760	157339	NO2	No	0.0	28.0		1.5
Maid P3A	Down Pipe of Sainsbury façade facing High St but adjacent to junction of track to car park TN27 9NE	Roadside	583461	144207	NO2	No	0.0	1.5		1.8
Maid P3B	On road sign pole for The Good Intent, junction of North St with Kings Road TN279NT	Roadside	583292	144352	NO2	No	n/a	2m		1.8
Maid P3D	TN27 9QT opposite Headcorn Primary school on road sign pole new site March 2019 replaces P3B	Roadside	583367	144399	NO2	No	8.0	1.0		2.0

Notes:

(1) 0m if the monitoring site is at a location of exposure (e.g., installed on the façade of a residential property).

(2) N/A if not applicable.

Table A.3 – Annual Mean NO_2 Monitoring Results: Automatic Monitoring (µg/m³)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2023 (%) (2)	2019	2020	2021	2022	2023
CM2	580108	159703	Rural	97.4	97.4	24.2	8	8	8	7
CM3	576337	155183	Roadside	99.5	99.5	**68**	**53**	**49**	**47**	**41**

Notes:

The annual mean concentrations are presented as µg/m³.

Exceedances of the NO_2 annual mean objective of 40µg/m³ are shown in **bold**.

All means have been "annualised" as per LAQM.TG22 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g., if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

Table A.4 – Annual Mean NO_2 Monitoring Results: Non-Automatic Monitoring ($\mu g/m^3$)

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2023 (%) (2)	2019	2020	2021	2022	2023
Maid6.1, Maid6.2, Maid6.3	580101	159695	Rural	100	100.0	10.3	8.0	8.2	7.5	7.1
Maid19	576692	153992	Roadside	75	75.0	19.7	12.0	15.7	15.3	14.1
Maid45	577410	155166	Urban Background	73.1	73.1	14.6	9.7	10.9	11.9	11.1
Maid49	573309	154789	Roadside	100	100.0	31.8	22.3	24.7	23.6	21.9
Maid52	573349	154790	Roadside	100	100.0	33.6	22.3	28.4	27.7	24.9
Maid53	576724	153948	Roadside	92.3	92.3	**52.1**	**40.1**	**44.3**	**42.0**	**42.4**
Maid56	576735	154007	Roadside	100	100.0	21.6	15.9	17.7	16.0	16.0
Maid63	577037	157739	Roadside	100	100.0	29.0	20.4	20.6	21.8	19.5
Maid70	576469	155710	Roadside	90.4	90.4	33.5	25.9	30.4	27.6	23.9
Maid80	576314	156312	Kerbside	82.7	82.7	31.1	22.2	23.0	24.1	21.9
Maid81	576303	155329	Kerbside	90.4	90.4	<u>**60.2**</u>	**59.2**	<u>**60.3**</u>	**54.9**	**57.1**
Maid94	575822	155579	Roadside	80.8	80.8	33.1	25.6	27.1	27.4	24.9
Maid96	576346	155183	Roadside	100	100.0	<u>**75.2**</u>	<u>**64.8**</u>	<u>**62.6**</u>	<u>**62.5**</u>	**57.8**

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2023 (%) [2]	2019	2020	2021	2022	2023
Maid97	576253	155534	Roadside	67.3	67.3	37.5	31.1	29.9	31.6	26.8
Maid98	576258	155422	Roadside	82.7	82.7	30.8	25.9	27.4	25.9	24.9
Maid112	577770	155613	Roadside	92.3	92.3	34.1	24.7	27.8	26.4	25.3
Maid116	573972	158753	Roadside	82.7	82.7	**49.2**	**42.7**	**44.6**	**43.4**	39.6
Maid122	576386	155034	Roadside	75	75.0	<u>**73.4**</u>	**55.0**	**57.6**	<u>**60.6**</u>	**53.1**
Maid123	576378	155032	Roadside	90.4	90.4	**55.5**	38.4	36.8	**40.9**	38.8
Maid126	573269	155266	Roadside	84.6	84.6	26.2	18.6	20.6	20.2	17.2
Maid127	576295	155376	Roadside	90.4	90.4	36.2	35.7	36.3	34.7	38.0
Maid128.1, Maid128.2, Maid128.3	576337	155183	Roadside	100	100.0		**54.0**	**50.1**	**49.3**	**45.5**
Maid133	578412	152598	Roadside	90.4	90.4	20.8	16.0	18.0	19.4	20.4
Maid134	573458	153585	Roadside	100	100.0	24.9	18.6	23.0	17.5	19.6
Maid135	573315	154978	Roadside	75	75.0	32.8	25.4	29.0	26.6	23.5
Maid140	577684	157324	Roadside	57.7	57.7				20.3	18.5

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2023 (%) (2)	2019	2020	2021	2022	2023
Maid142	576292	155307	Roadside	100	100.0				35.3	33.7
Maid143	577691	157315	Roadside	84.6	84.6				27.5	30.8
Maid145	575994	155073	Roadside	100	100.0				28.3	25.7
Maid147	575696	155411	Roadside	92.3	92.3				21.8	20.1
Maid149	576473	153406	Roadside	100	92.3					16.7
Maid150	574678	155408	Roadside	90.4	82.7				21.1	10.5
Maid151	575078	155981	Roadside	100	100.0					32.8
Maid152	574972	156189	Roadside	80.8	80.8					26.1
Maid153	576041	155548	Roadside	55.8	55.8					39.2
Maid154	577760	157339	Roadside	100	100.0					23.2
Maid P3A	583461	144207	Roadside	75	75.0	19.3	17.7	17.1	16.5	16.4
Maid P3B	583292	144352	Roadside	75	75.0			15.1	15.8	16.8
Maid P3D	583367	144399	Roadside	92.3	92.3	13.6	9.8	11.2	11.5	9.7

Notes:

The annual mean concentrations are presented as µg/m^3.

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined**.

Means for diffusion tubes have been corrected for bias. All means have been “annualised” as per LAQM.TG22 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g., if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

Figure A.1 – Trends in Annual Mean NO_2 Concentrations in Maidstone AQMA

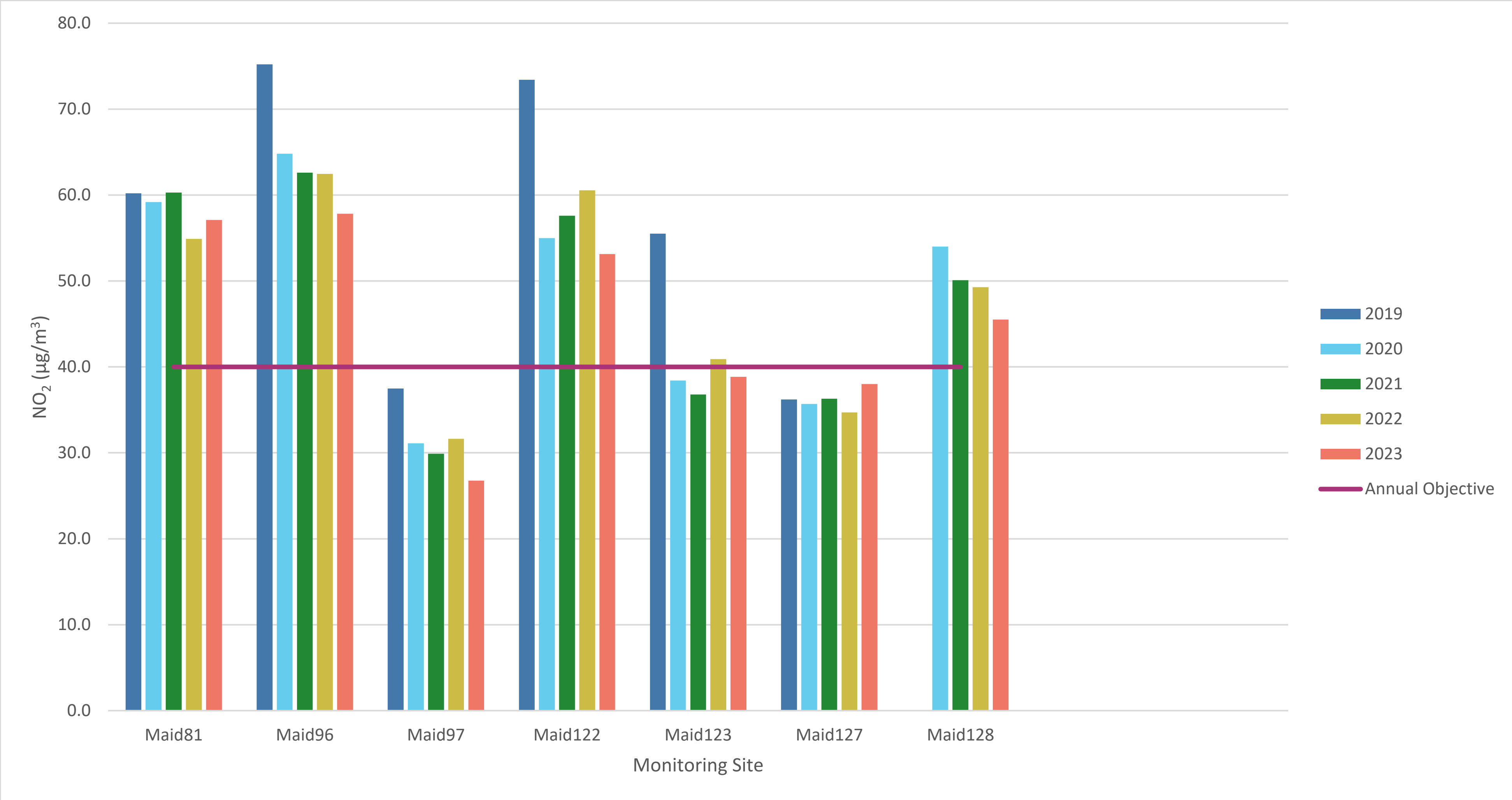


Figure A.2 – Trends in Annual Mean NO_2 Concentrations outside of the Maidstone AQMA (MAID6-MAID52)

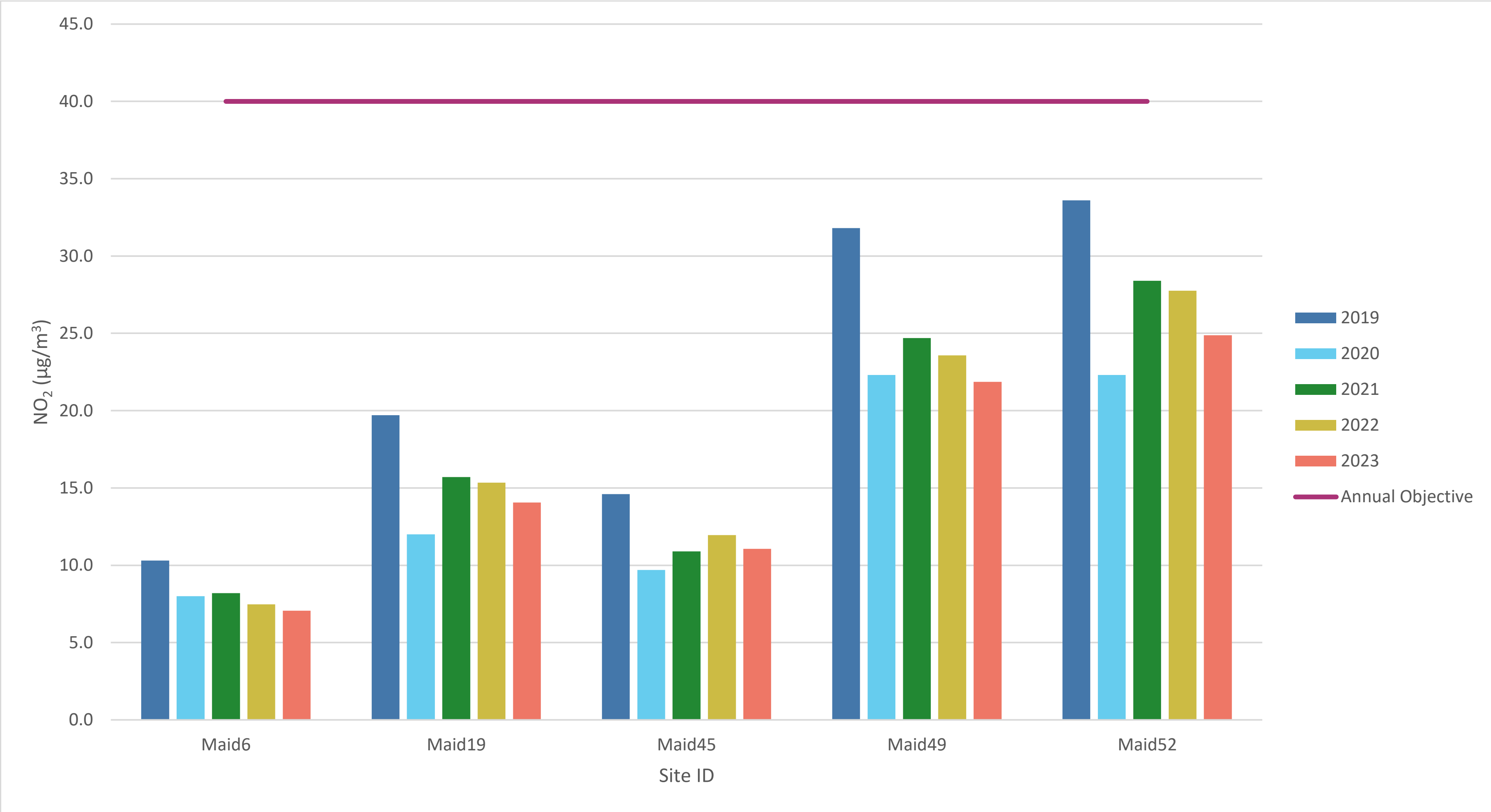


Figure A.3 – Trends in Annual Mean NO_2 Concentrations outside of the Maidstone AQMA (MAID94-MAID126)

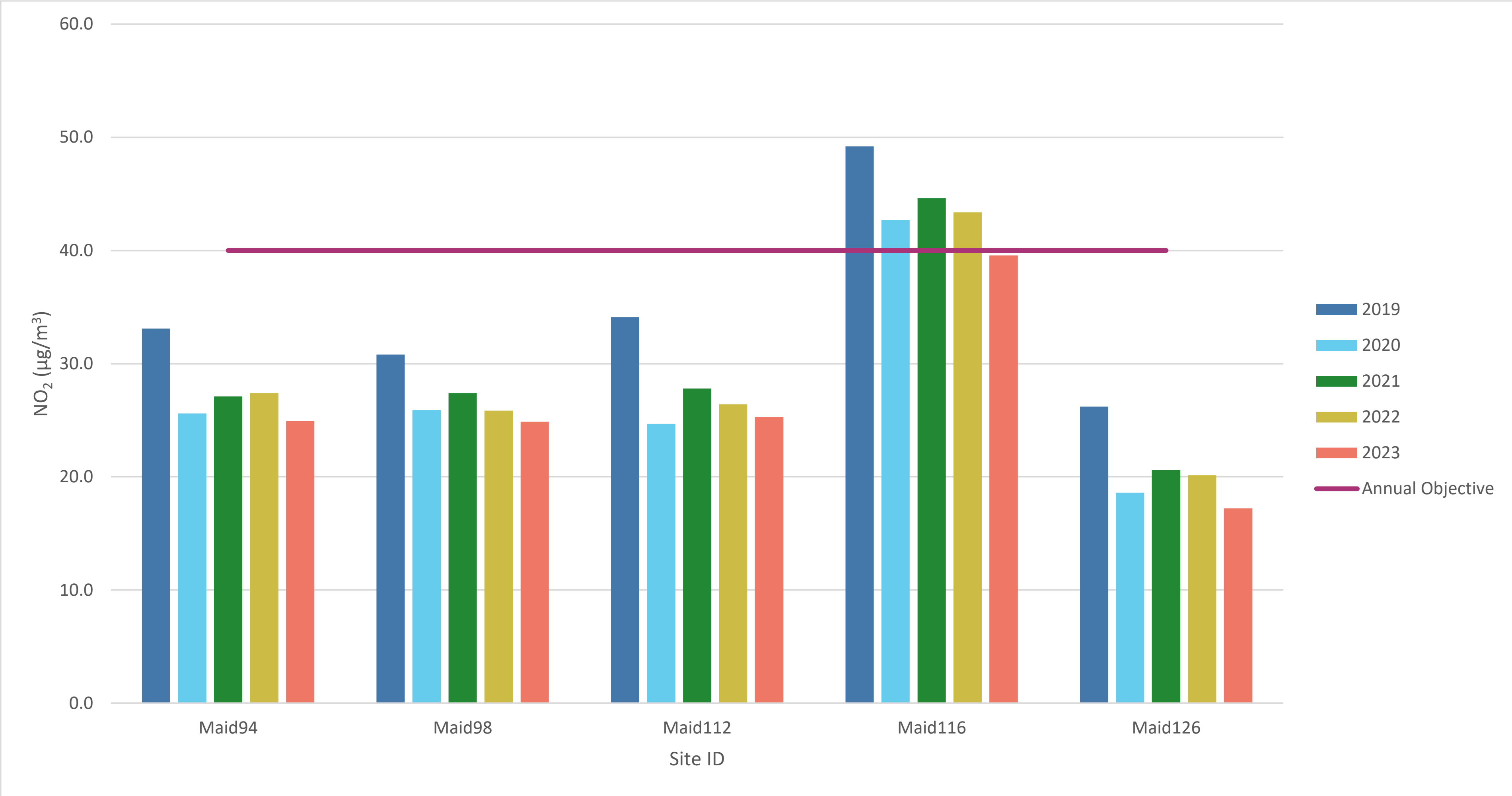


Figure A.4 – Trends in Annual Mean NO_2 Concentrations outside of the Maidstone AQMA (MAID133-MAID142)

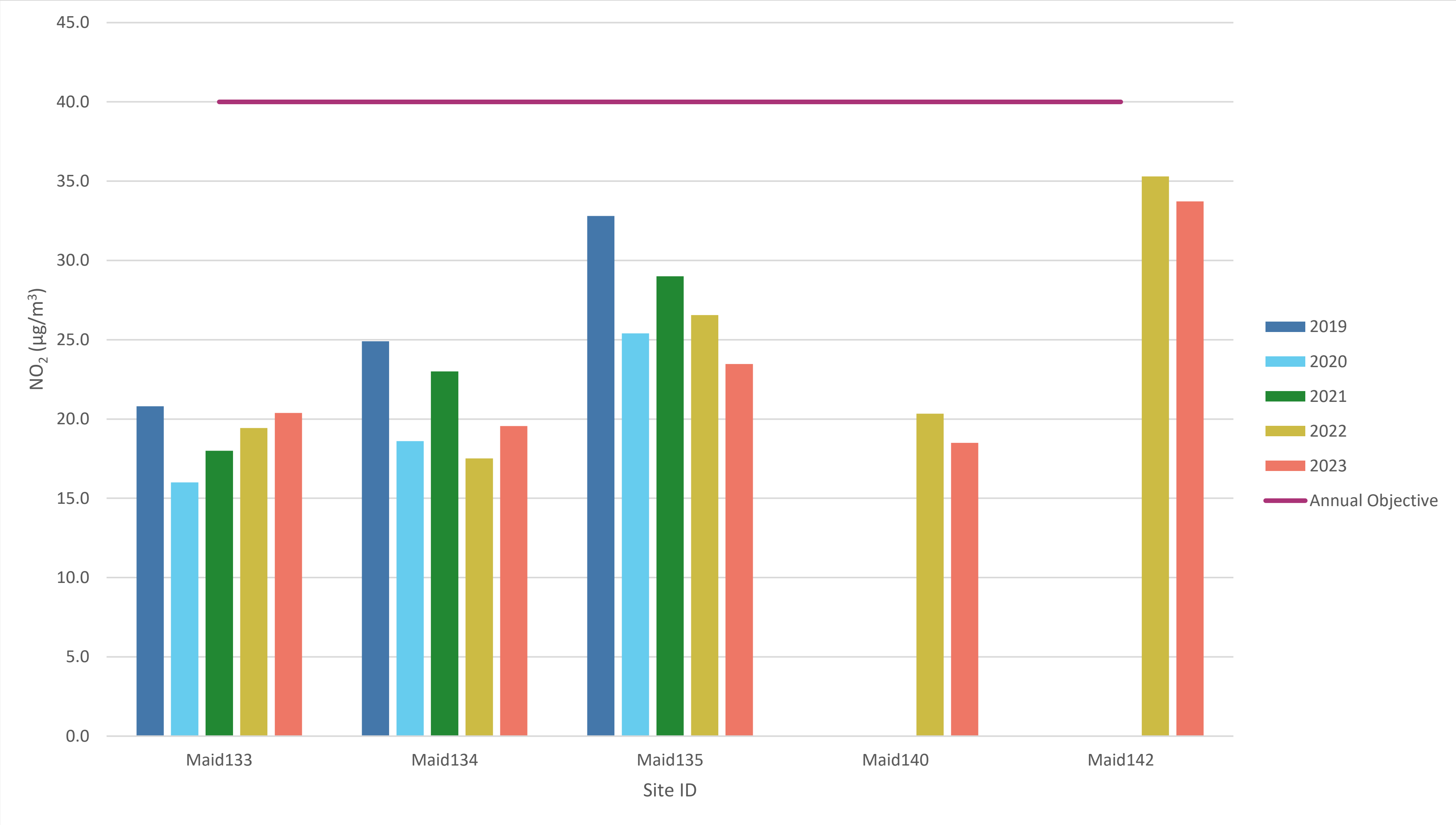


Figure A.5 – Trends in Annual Mean NO_2 Concentrations outside of the Maidstone AQMA (MAID143-MAID150)

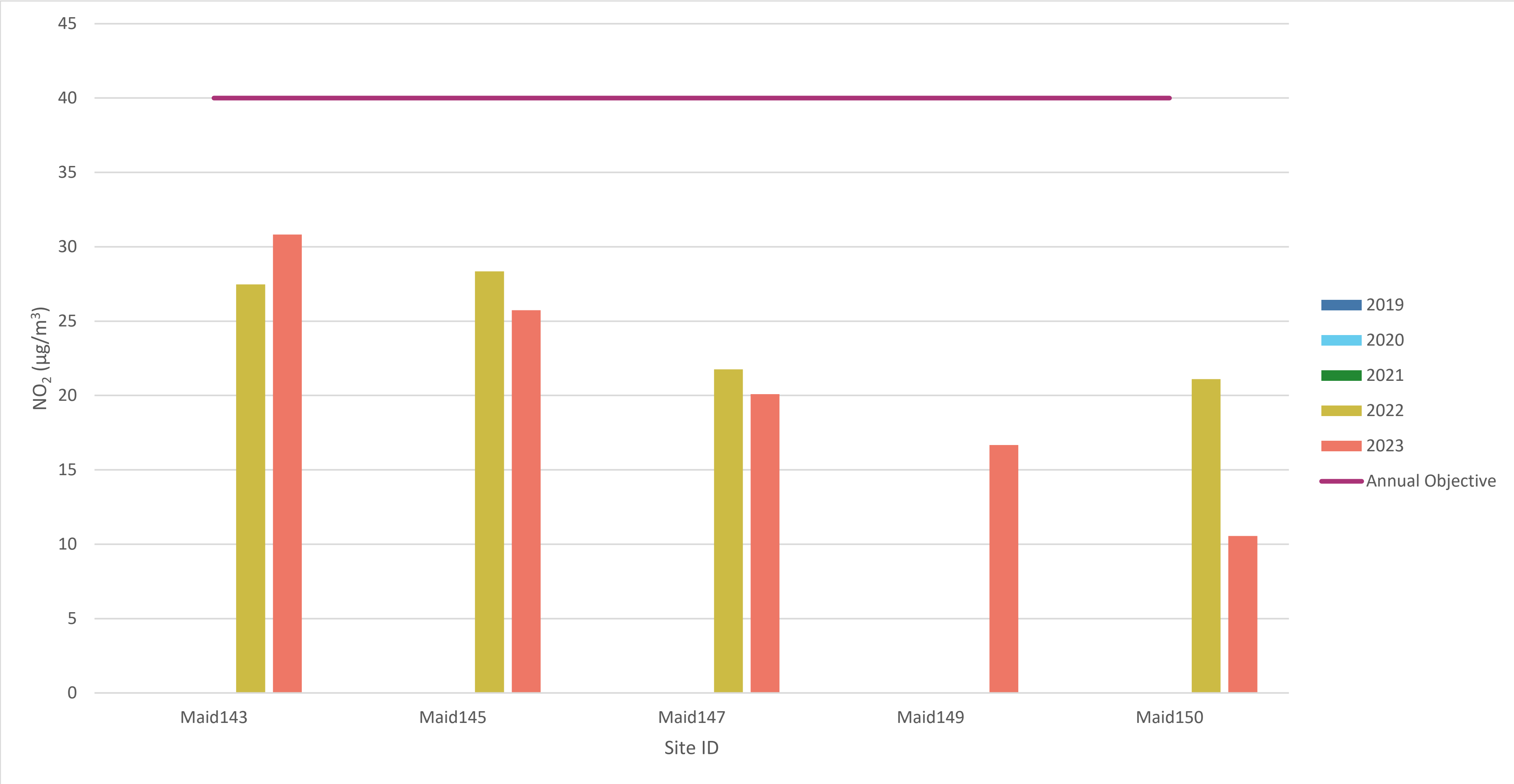


Figure A.6 – Trends in Annual Mean NO_2 Concentrations outside of the Maidstone AQMA (MAID151-MAID154)

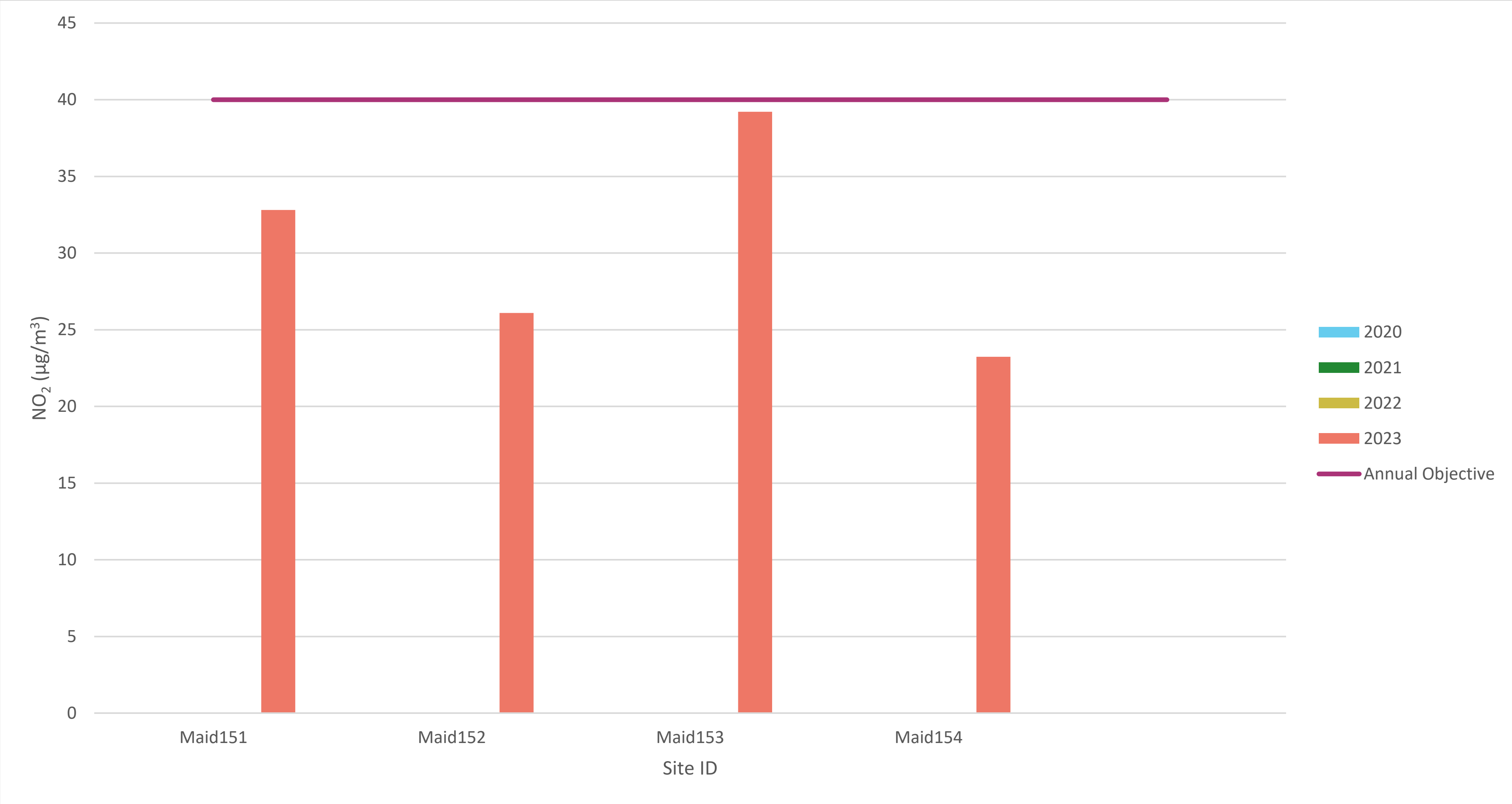


Figure A.7 – Trends in Annual Mean NO_2 Concentrations in Rural Parish Tubes

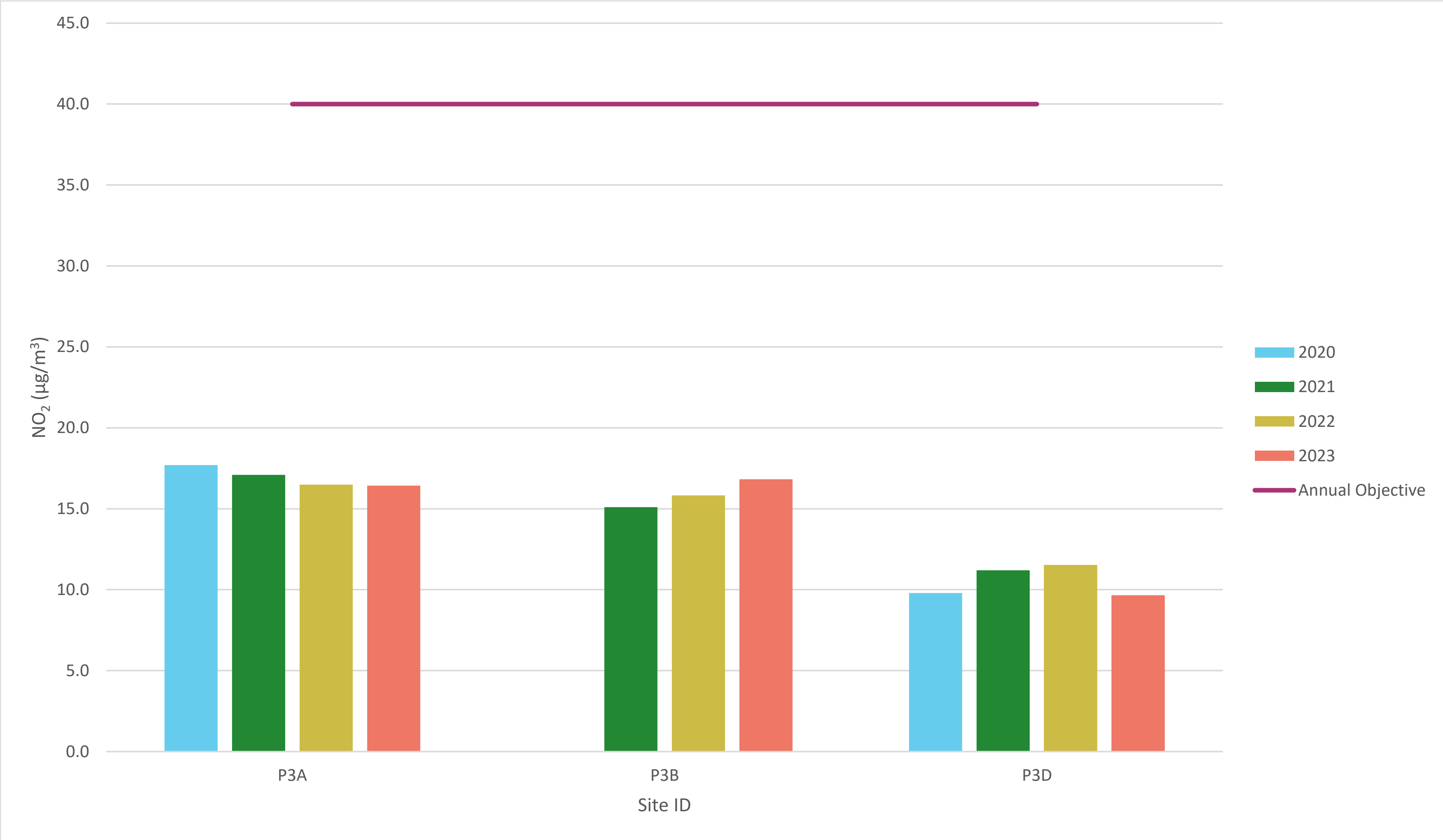


Table A.5 – 1-Hour Mean NO_2 Monitoring Results, Number of 1-Hour Means > 200µg/m^3

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2023 (%) (2)	2019	2020	2021	2022	2023
CM2	580108	159703	Rural	97.4	97.4	0	0	0	0	0
CM3	576337	155183	Roadside	99.5	99.5	**55**	6	5	0	0

Notes:

Results are presented as the number of 1-hour periods where concentrations greater than 200µg/m^3 have been recorded.

Exceedances of the NO_2 1-hour mean objective (200µg/m^3 not to be exceeded more than 18 times/year) are shown in **bold**.

If the period of valid data is less than 85%, the 99.8th percentile of 1-hour means is provided in brackets.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g., if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

Figure A.8 – Trends in Number of NO_2 1-Hour Means > 200µg/m^3

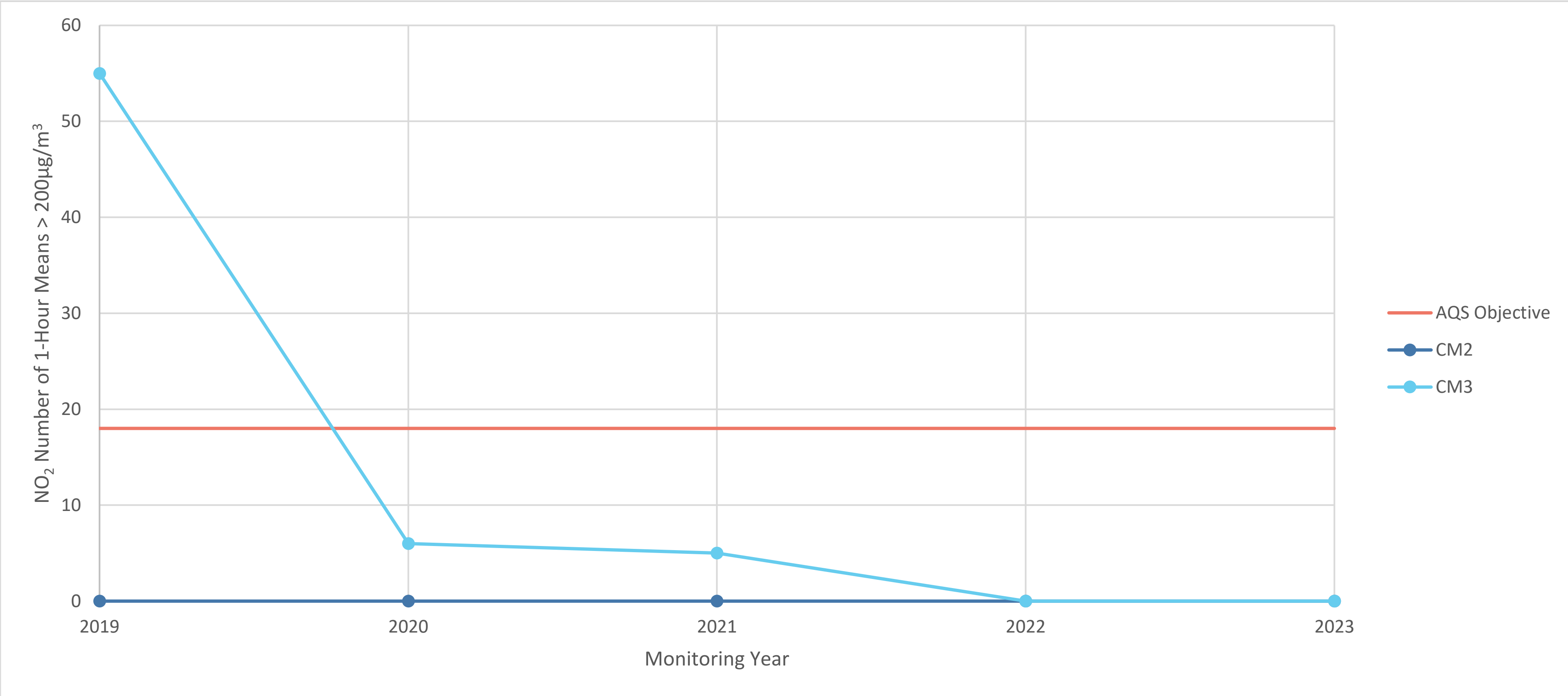


Table A.6 – Annual Mean PM_{10} Monitoring Results ($\mu g/m^3$)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2023 (%) (2)	2019	2020	2021	2022	2023
CM2	580108	159703	Rural	86.5	86.5	18	14	13	13	12
CM3	576337	155183	Roadside	99.3	99.3	27	23	22	22	17

Notes:

The annual mean concentrations are presented as $\mu g/m^3$.

Exceedances of the PM_{10} annual mean objective of $40\mu g/m^3$ are shown in **bold**.

All means have been "annualised" as per LAQM.TG22 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g., if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

Figure A.9 – Trends in Annual Mean PM_{10} Concentrations

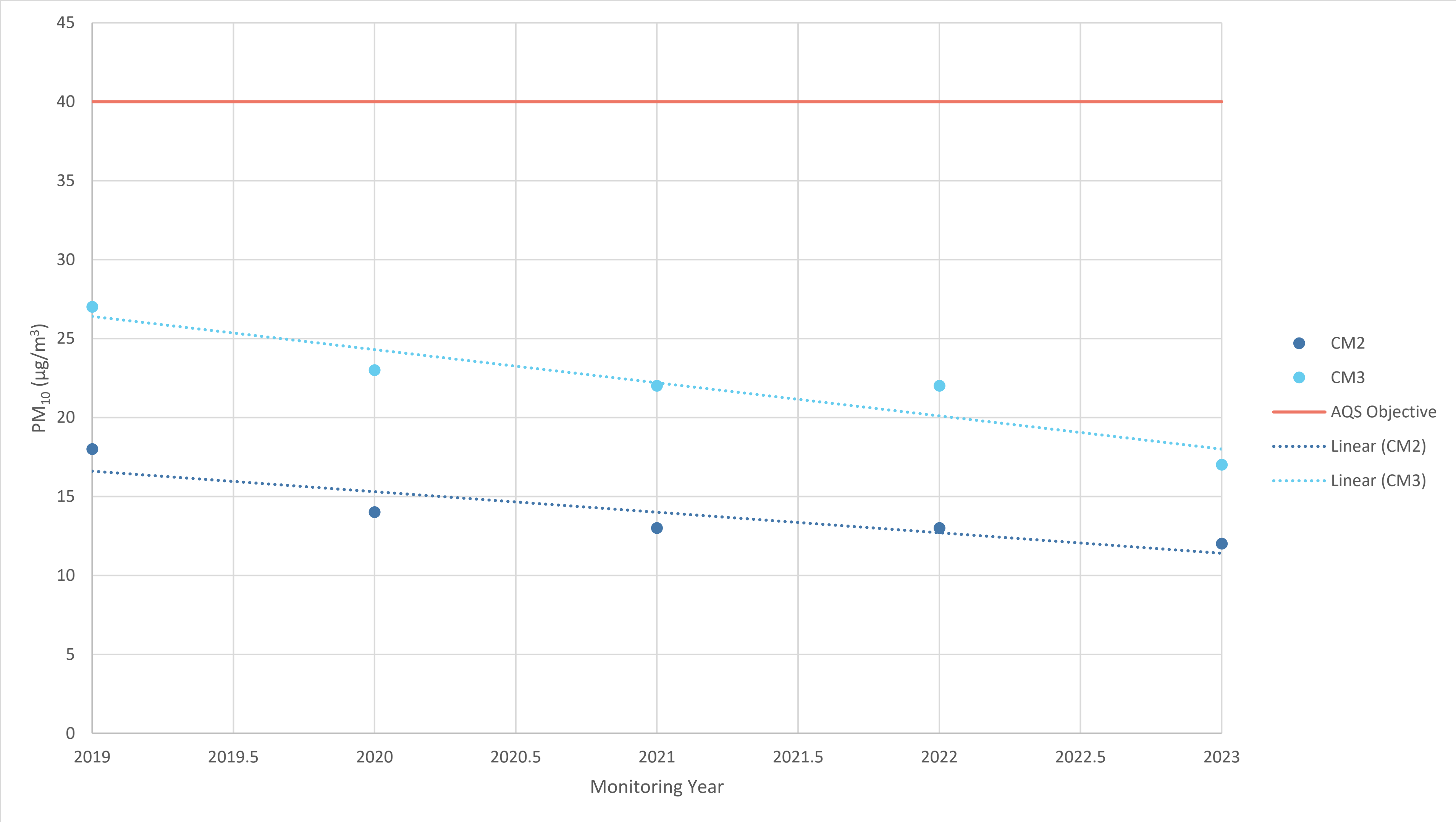


Table A.7 – 24-Hour Mean PM_{10} Monitoring Results, Number of PM_{10} 24-Hour Means > 50µg/m³

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2023 (%) (2)	2019	2020	2021	2022	2023
CM2	580108	159703	Rural	86.5	86.5	10	0	1	0	0
CM3	576337	155183	Roadside	99.3	99.3	13	2	3	1	0

Notes:

Results are presented as the number of 24-hour periods where daily mean concentrations greater than 50µg/m³ have been recorded.

Exceedances of the PM_{10} 24-hour mean objective (50µg/m³ not to be exceeded more than 35 times/year) are shown in **bold**.

If the period of valid data is less than 85%, the 90.4th percentile of 24-hour means is provided in brackets.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g., if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

Figure A.10 – Trends in Number of 24-Hour Mean PM_{10} Results > 50µg/m³

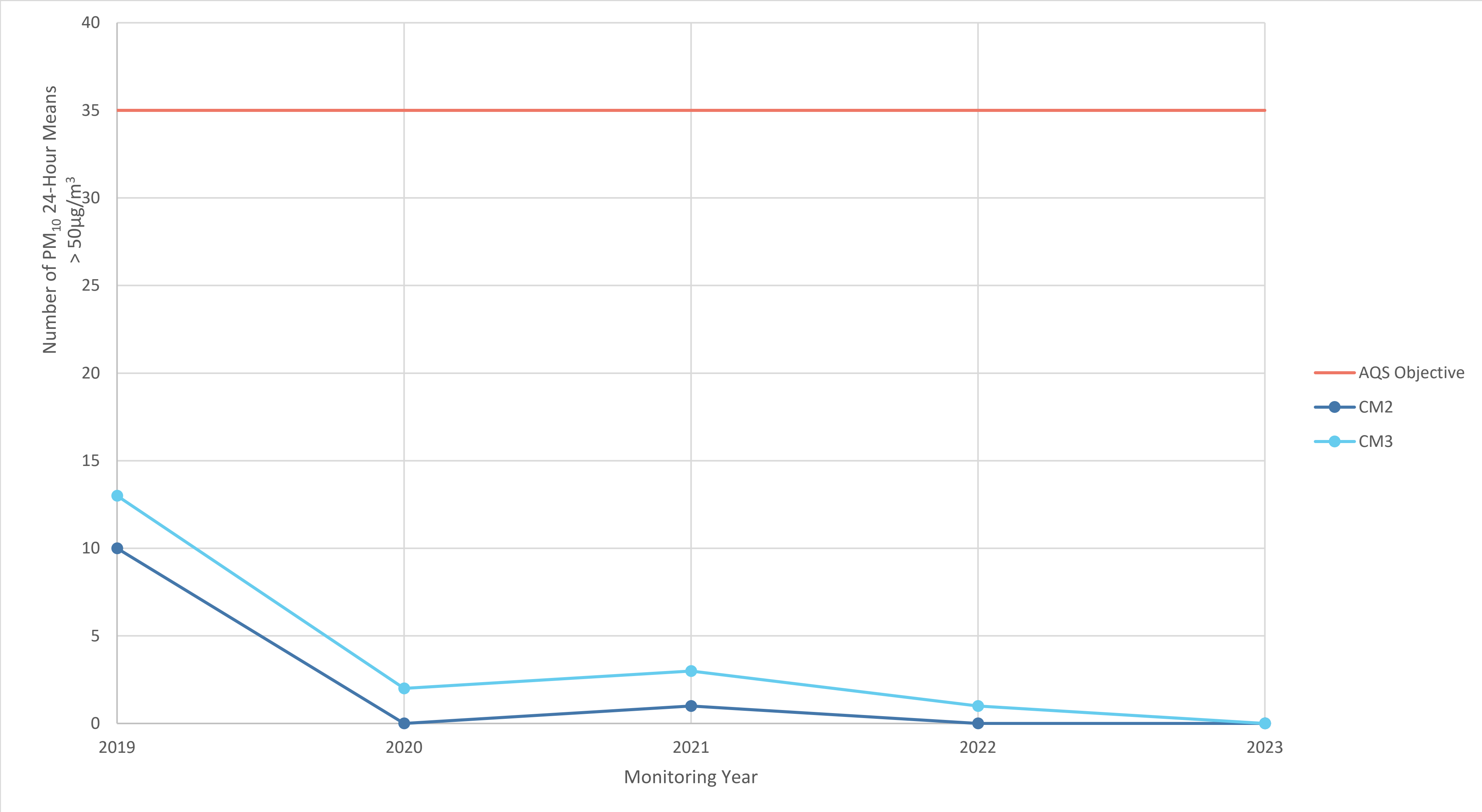


Table A.8 – Annual Mean $PM_{2.5}$ Monitoring Results ($\mu g/m^3$)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2023 (%) (2)	2019	2020	2021	2022	2023
CM3	576337	155183	Roadside	98.7	98.7	18	16	14	14	12

Notes:

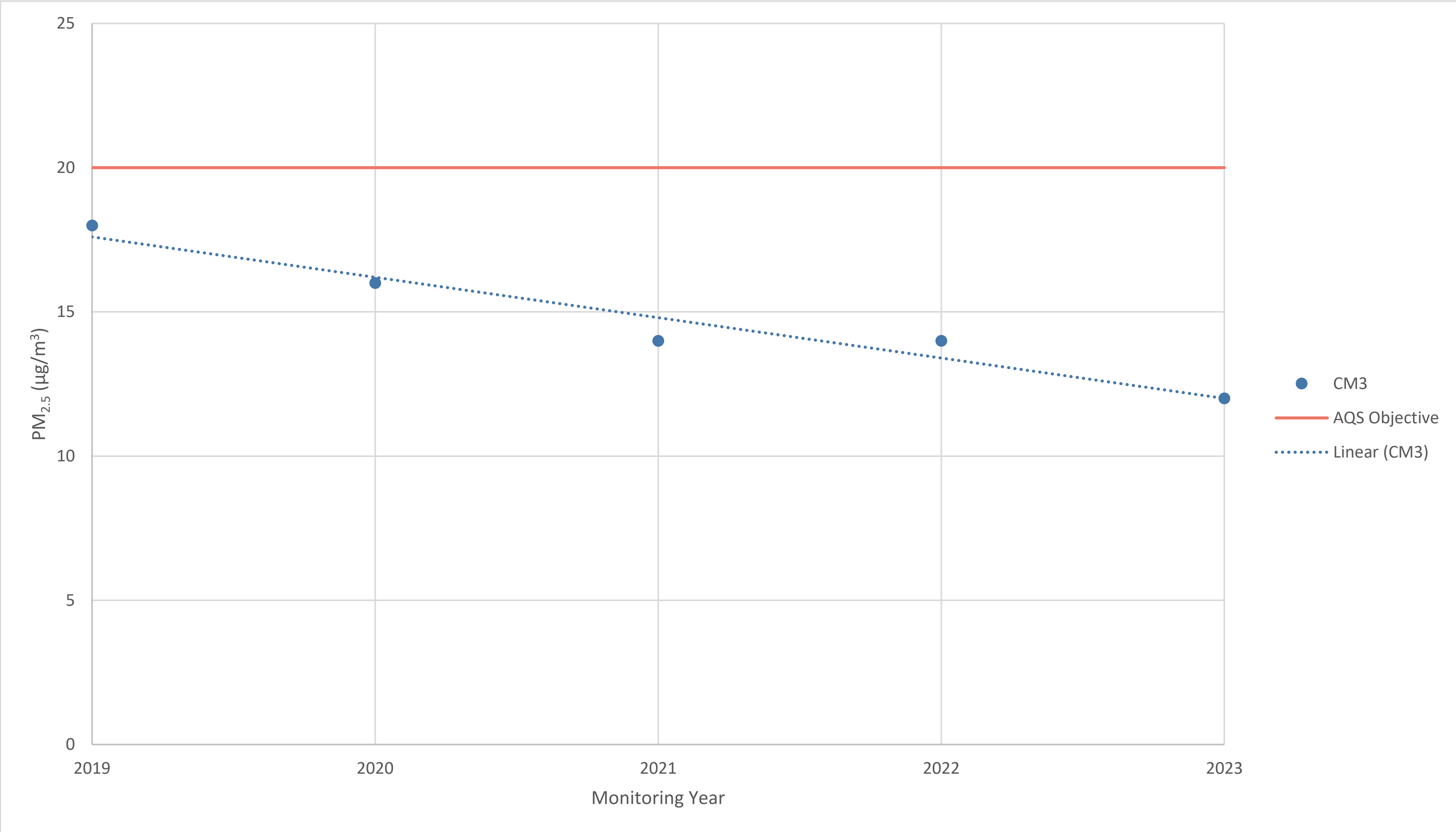
The annual mean concentrations are presented as $\mu g/m^3$.

All means have been "annualised" as per LAQM.TG22 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g., if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

Figure A.11 – Trends in Annual Mean $PM_{2.5}$ Concentrations



Appendix B: Full Monthly Diffusion Tube Results for 2023

Table B.1 – NO_2 2023 Diffusion Tube Results (µg/m³)

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted <(x.x)>	Annual Mean: Distance Corrected to Nearest Exposure	Comment
Maid6.1	580101	159695	3.0	15.7	8.0	8.4	9.0	8.6	6.7	7.9	10.2	7.9	12.5	8.6	-	-	-	Triplicate Site with Maid6.1, Maid6.2 and Maid6.3 - Annual data provided for Maid6.3 only
Maid6.2	580101	159695	11.2	13.0	7.5	8.1	6.2	9.0	15.4	7.1	9.7	9.2	4.3	7.6	-	-	-	Triplicate Site with Maid6.1, Maid6.2 and Maid6.3 - Annual data provided for Maid6.3 only
Maid6.3	580101	159695	14.2	13.4	9.5	7.9	7.0	8.2	5.5	7.5	11.6	8.3	12.5	9.6	9.2	7.1	-	Triplicate Site with Maid6.1, Maid6.2 and Maid6.3 - Annual data provided for Maid6.3 only
Maid19	576692	153992		27.7		22.3	17.5	15.9	8.2	14.8	20.9	17.0	20.0		18.3	14.1	-	
Maid45	577410	155166		19.0	6.1	11.1	37.1		8.8		12.8	10.6	15.1	8.8	14.4	11.1	-	
Maid49	573309	154789	33.5	39.7	27.4	30.0	22.9	28.1	19.9	27.3	31.4	28.0	30.6	21.8	28.4	21.9	-	
Maid52	573349	154790	35.5	41.0	32.5	31.4	20.2	30.4	25.9	31.3	41.6	32.1	37.0	28.9	32.3	24.9	-	
Maid53	576724	153948	76.0	65.3	53.6	48.4		45.5	46.1	49.8	57.8	53.1	55.7	54.4	55.1	**42.4**	36.4	
Maid56	576735	154007	29.6	27.3	21.0	18.7	14.4	15.4	16.4	18.2	23.1	20.2	26.0	18.8	20.8	16.0	-	
Maid63	577037	157739	27.9	32.7	23.3	27.5	15.5	22.3	19.5	23.9	30.9	29.2	29.7	21.5	25.3	19.5	-	
Maid70	576469	155710	37.0	39.9	23.9	29.3	21.1	27.6	26.4		36.4	34.3	32.3	32.6	31.0	23.9	-	
Maid80	576314	156312	35.9	38.2	23.4	28.9	22.7		18.0	24.6	31.5	27.8	32.8	x	28.4	21.9	-	
Maid81	576303	155329	69.9	82.0	73.1	68.3	76.9	73.4	64.7		91.8	82.4	70.6	62.8	74.2	**57.1**	-	
Maid94	575822	155579	35.9	39.0		33.0	28.4	33.6	21.6		39.0	30.9	35.8	26.4	32.4	24.9	-	
Maid96	576346	155183	75.7	85.8	53.4	79.4	74.7	91.0	62.2	73.8	105.5	82.4	67.8	49.7	75.1	**57.8**	-	
Maid97	576253	155534	36.9		19.5	38.9	41.8	44.8			36.2	38.0	30.4		35.8	26.8	-	
Maid98	576258	155422	33.0	58.2	18.6		43.9	37.2	19.9		32.7	28.4	28.6	22.6	32.3	24.9	-	

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted <(x.x)>	Annual Mean: Distance Corrected to Nearest Exposure	Comment
Maid112	577770	155613	39.4	39.9	33.3	33.6	32.8	31.8	29.7	37.1		28.9	29.7	25.0	32.8	25.3	-	
Maid116	573972	158753	60.1	66.8	45.9		49.0		38.8	45.4	61.7		54.0	40.7	51.4	39.6	29.6	
Maid122	576386	155034	70.8			73.5		69.4	48.4	66.6	89.9	80.5	76.0	45.9	69.0	**53.1**	-	
Maid123	576378	155032	58.9	63.5		44.4	58.8	43.7	38.3	44.5	59.0	47.7	54.2	41.9	50.4	38.8	27.9	
Maid126	573269	155266		33.4	23.0	21.8	19.3	18.1	12.3	19.3	26.0	23.3	27.2		22.4	17.2	-	
Maid127	576295	155376	58.0	69.2	55.1	44.9	71.5	49.6	37.2		43.8	33.2	44.2	36.3	49.4	38.0	32.8	
Maid128.1	576337	155183	74.7	77.5	55.2	60.9	46.9	56.2	51.4	54.7	73.0	59.2	66.8	27.4	-	-	-	Triplicate Site with Maid128.1, Maid128.2 and Maid128.3 - Annual data provided for Maid128.3 only
Maid128.2	576337	155183	72.5	78.0	69.9	61.6	46.8	51.3	51.1	56.1	73.1	56.0	64.7	27.7	-	-	-	Triplicate Site with Maid128.1, Maid128.2 and Maid128.3 - Annual data provided for Maid128.3 only
Maid128.3	576337	155183	74.0	76.1	72.0	58.8		51.6	56.6	52.4	73.7	58.9	66.1	28.7	59.1	**45.5**	28.7	Triplicate Site with Maid128.1, Maid128.2 and Maid128.3 - Annual data provided for Maid128.3 only
Maid133	578412	152598	26.7	29.5		27.4	25.8	27.8	20.7	27.9	33.2	26.0	25.5	20.6	26.5	20.4	-	
Maid134	573458	153585	28.5	27.0	27.0	25.7	20.0	24.6	21.4	19.3	34.3	27.7	31.0	18.2	25.4	19.6	-	
Maid135	573315	154978	39.3		32.5	31.2	25.1	29.1	26.3	27.9	34.4	28.6			30.5	23.5	-	
Maid140	577684	157324		34.5	21.7		16.6	20.6			26.5	27.0		18.6	23.6	18.5	-	
Maid142	576292	155307	64.6	47.3	50.2	37.2	31.6	38.6	45.4	13.3	51.4	50.9	48.5	46.7	43.8	33.7	-	
Maid143	577691	157315			47.8	38.7	33.4	37.8	30.5	38.0	49.1	48.0	42.8	34.2	40.0	30.8	-	
Maid145	575994	155073	38.5	58.9	31.5	37.5	35.7	32.6	19.7	24.2	33.9	36.4	33.9	18.3	33.4	25.7	-	
Maid147	575696	155411	34.2	39.9	30.3	29.4	24.8	25.6	16.0	18.8	27.2	12.0	28.8		26.1	20.1	-	
Maid149	576473	153406	21.6	40.3	18.8	20.4	21.2	24.9	12.8	17.4	20.6	15.7	24.5		21.7	16.7	-	
Maid150	574678	155408		20.4	12.6	13.5	10.1	21.6	10.0	9.6	13.0	13.7		12.5	13.7	10.5	-	
Maid151	575078	155981	49.1	50.3	42.8	42.9	38.1	54.8	31.1	37.0	44.3	40.6	40.8	39.4	42.6	32.8	-	

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted <(x.x)>	Annual Mean: Distance Corrected to Nearest Exposure	Comment
Maid1 52	574972	156189	35.8	44.7	34.2	33.8	29.1	24.4	26.2		37.5	35.3		37.9	33.9	26.1	-	
Maid1 53	576041	155548		66.6		46.2			48.6		64.6	41.8	48.5	56.2	53.2	39.2	20.9	
Maid1 54	577760	157339	40.4	43.8	31.1	31.6	30.6	25.0	21.9	25.2	26.1	26.5	29.0	30.9	30.2	23.2	-	
Maid P3A	583461	144207		30.0	22.4		13.9	20.3	17.8		24.5	18.2	20.6	24.4	21.3	16.4	-	
Maid P3B	583292	144352		32.5	19.5	20.4	15.5	17.4			22.9	18.0	28.8	21.7	21.9	16.8	-	
Maid P3D	583367	144399		19.5	13.4	14.0	10.8	10.8	10.5	9.1	13.1	10.2	17.0	9.6	12.5	9.7	-	

Notes:

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined**.

See Appendix C for details on bias adjustment and annualisation.

Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC

New or Changed Sources Identified Within Maidstone Borough During 2023

Maidstone Borough Council has not identified any new sources relating to air quality within the reporting year of 2023.

Additional Air Quality Works Undertaken by Maidstone Borough Council During 2023

Maidstone Borough Council has not completed any additional works within the reporting year of 2023.

QA/QC of Diffusion Tube Monitoring

All diffusion tubes deployed in Maidstone Borough during 2023 were supplied by Socotec (Didcot). Socotec is a UKAS accredited laboratory and participates in the in the new AIR-PT (Proficiency Test) Scheme previously known as the Workplace Analysis Scheme for Proficiency (WASP)) for NO_2 tube analysis and the Annual Field Inter-Comparison Exercise. These provide strict performance criteria for participating laboratories to meet, thereby ensuring NO_2 concentrations reported are of a high calibre. The lab follows the procedures set out in the Harmonisation Practical Guidance. In the latest available results, Socotec Didcot scored as follows: AIR-PT AR055 (Jan to Feb 2023) 100%, AIR-PT AR056, (May to June 2023) 100%, AIR-PT AR057 (July to August 2023) 100% and AIR-PT AR058 (September to October 2023) 100%. The percentage score reflects the results deemed to be satisfactory based upon the z-score of < ± 2. Based on 28 studies, 100% of all local Authority co-location studies in 2023, using the 50% TEA in acetone preparation method, were rated as ‘good’ (tubes are considered to have "good" precision where the coefficient of variation of duplicate or triplicate diffusion tubes for eight or more periods during the year is less than 20%). All diffusion tubes were deployed in accordance with the 2023 diffusion tube calendar.

Diffusion Tube Annualisation

Data from 15 tube locations in Maidstone Borough required annualization in 2023. The tubes were annualised using DEFRA's diffusion tube data processing tool, with automatic data taken from with hourly data from Canterbury and Thurrock. The results appear in Table C2.

Table C.1 – Annualisation Summary (concentrations presented in μg/m^3)

Site ID	Annualisation Factor Canterbury	Annualisation Factor Thurrock	Annualisation Factor <Site 3 Name>	Annualisation Factor <Site 4 Name>	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean
Maid45	1.0006	0.9912			0.9959	14.4	14.3
Maid97	0.9442	0.9974			0.9708	35.8	34.8
Maid140	1.0154	1.0169			1.0161	23.6	24.0
Maid153	0.9737	0.9407			0.9572	53.2	50.9

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2023 ASR have been corrected for bias using an adjustment factor. Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.TG22 provides guidance with regard to the application of a bias adjustment factor to correct diffusion tube monitoring. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data taken from NO_x/NO_2 continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

Maidstone Borough Council have applied a national bias adjustment factor of 0.77 to the 2023 monitoring data. A summary of bias adjustment factors used by Maidstone Borough Council over the past five years is presented in Table C.2.

Local bias correction factors were calculated for the two automatic monitoring stations in Maidstone. The Diffusion Tube Data Processing Tool combined these into an overall local bias correction factor of 0.69

The national bias correction factor for Socotec, 50% TEA in acetone was 0.77 based on 28 studies. There is a large difference between the local and national bias correction factors which means that the choice between the two factors is quite significant. We will usually prefer to use a local bias correction factor if we feel that our local data is sufficiently robust. In the three previous years, 2022, 2021 and 2020, we have used local bias correction factors of 0.73, 0.74 and 0.75 respectively. Compared with previous years, the local bias correction factor for 2023 of 0.69, seemed very low, and would obviously flatter the corrected NO_2 levels, perhaps unrealistically so, despite the fact that both the diffusion tube and automatic monitoring data did seem to be robust.

Several approaches to bias correction can be taken. TG22 (sec 7.210) states “***Care should be taken to avoid applying a bias adjustment factor derived from a local colocation study carried out for concentrations that are very different to those being measured in the wider survey. In other words, co-location results from a low concentration site (typically a background site) should not be used to derive a bias adjustment factor for survey results from high concentration sites (typically roadside sites) and vice versa. There may be circumstances where this is not possible, and this will increase the uncertainty of the results.”***

The implication of this is that the Detling air quality station is not ideal for bias correcting other sites in Maidstone since it is a background site. Conversely, the Upper Stone Street has the highest NO_2 levels anywhere in Maidstone, so the Upper Stone Street site is ideal for bias correcting diffusion tubes in Upper Stone Street itself but arguably less suitable for bias correcting other sites in Maidstone. Therefore, Maidstone Borough Council have applied a national bias adjustment factor of 0.77 to the 2023 monitoring data. A summary of bias adjustment factors used by Maidstone Borough Council over the past five years is presented in Table C.2.

Table C.2 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2023	National	03/24	0.77
2022	Local		0.73
2021	Local	-	0.74
2020	Local	-	0.75
2019	National	03F/20	0.75

Table C.3 – Local Bias Adjustment Calculation

For completeness, we have included the local bias correction factor calculation below although we ultimately decided to use a national bias correction factor to adjust 2023 data.

	Local Bias Adjustment Input 1	Local Bias Adjustment Input 2	Local Bias Adjustment Input 3	Local Bias Adjustment Input 4	Local Bias Adjustment Input 5
Periods used to calculate bias	12	9			
Bias Factor A	0.69 (0.61 - 0.79)	0.69 (0.61 - 0.81)			
Bias Factor B	45% (27% - 63%)	44% (24% - 64%)			
Diffusion Tube Mean (µg/m³)	59.1	9.5			
Mean CV (Precision)	3.4%	9.9%			
Automatic Mean (µg/m³)	40.8	6.6			
Data Capture	99%	100%			
Adjusted Tube Mean (µg/m³)	41 (36 - 47)	7 (6 - 8)			

NO_2 Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO_2 concentration at the nearest location relevant for exposure has been estimated using the Diffusion Tube Data Processing Tool/NO_2 fall-off with distance calculator available on the LAQM Support website. Where appropriate, non-automatic annual mean NO_2 concentrations corrected for distance are presented in Table B.1.

Table C.4 – Non-Automatic NO_2 Fall off With Distance Calculations (concentrations presented in µg/m³)

Site ID	Distance (m): Monitoring Site to Kerb	Distance (m): Receptor to Kerb	Monitored Concentration (Annualised and Bias Adjusted	Background Concentration	Concentration Predicted at Receptor	Comments
Maid53	1.0	2.5	42.4	10.0	*36.4*	*Predicted concentration at Receptor within 10% the AQS objective.*
Maid116	1.0	5.3	39.6	10.0	29.6	
Maid123	1.5	8.4	38.8	10.0	27.9	
Maid127	1.5	3.5	38.0	10	32.8	
Maid128.1, Maid128.2, Maid128.3	1.5	13.0	45.5	10	28.7	*Distance corrected to nearest building by DTDPT, but the building is commercial rather than residential.*
Maid153	2.0	29.0	39.2	10.0	20.9	*Warning: your receptor is more than 20m further from the kerb than your monitor - treat result with caution.*

Six sites required distance correction in Maidstone in 2023, as shown in Table C4 above.

Site Maid 53 is the old Wheatsheaf Public House which is currently standing empty and awaiting demolition. Therefore, there is no longer a relevant receptor at this site. Maid 116 is at Forstal Rd Cottages in Allington and is a roadside site where we have frequently measured exceedances of the annual mean objective for NO_2. However, the receptors here are set well back from the road and the distance corrected levels are well below the objective. Sites Maid 123 and Maid 128, as discussed earlier, are in the Upper Stone Street AQMA and Maid 127 is at Wrens Cross which adjoins the AQMA Maid 53 was a new site in 2023, in Palace Avenue. It is in front of the Len House building which is in the process of being converted from commercial to residential use, but is set well back from the road, and will not introduce any new receptors into an exceedance of the objective.

QA/QC of Automatic Monitoring

Calibration of the Maidstone monitoring stations is undertaken fortnightly by MBC's Environmental Protection Team. Matts Monitors undertake 6 monthly servicing, and the QA/QC is part of the Kent and Medway Air Quality Monitoring Network (K&MAQMN) which includes daily data checks and annual audits. The K&MAQMN contract is run by Ricardo Energy and Environment who ratify the data. Data is available via the KentAir website www.kentair.org.uk All of MBC's previous ASRs are available via the KentAir website.

QA/QC of Automatic Air Quality Instruments

Data ratification in Maidstone Borough was undertaken by Ricardo Energy and Environment

QA/QC of Automatic Air Quality Instruments

Air quality measurements from automatic instruments are validated and ratified to the standards of the AURN and those described in the Local Air Quality Management – Technical Guidance LAQM (TG22) https://laqm.defra.gov.uk/technical-guidance

Validation

This process operates on data during the data collection stage. All data are continually screened algorithmically and manually for anomalies. There are several techniques designed to discover spurious and unusual measurements within a very large dataset. These anomalies may be due to equipment failure, human error, power failures, interference or other disturbances. Automatic screening can only safely identify spurious results that need further manual investigation.

Raw data from the gaseous instruments (e.g., NOx, O_3, SO_2 and CO) are scaled into concentrations using the latest values derived from the manual and automatic calibrations. These instruments are not absolute and suffer drifts. Both the zero baseline (background) and the sensitivity may change over time. Regular calibrations with certified gas standards are used to measure the zero and sensitivity. However, these are only valid for the moment of the calibration since the instrument will continue to drift. Raw measurements from particulate instruments (e.g., PM_{10} and $PM_{2.5}$) generally do not require scaling into concentrations. The original raw data are always preserved intact while the processed data are dynamically scaled and edited.

Ratification

This is the process that finalises the data to produce the measurements suitable for reporting. All available information is critically assessed so that the best data scaling is applied, and all anomalies are appropriately edited. Generally, this operates at three-, six- or twelve-month intervals. However, unexpected faults can be identified during the instrument routine services or independent audits which are often at 6-monthly intervals. In practice, therefore, the data can only be fully ratified in 12-month or annual periods. The data processing performed during the three- and six-monthly cycles helps build a reliable dataset that is finalised at the end of the year.

There is a diverse range of additional information that can be essential to the correct understanding and editing of data anomalies. These may include

· The correct scaling of data

· Ignoring calibrations that were poor e.g., a spent zero scrubber

· Closely tracking rapid drifts or eliminating the data

· Comparing the measurements with other pollutants and nearby sites

· Corrections due to span cylinder drift

· Corrections due to flow drifts for the particulate instruments

· Corrections for ozone instrument sensitivity drifts

· Eliminating measurements for NO2 conversion inefficiencies

· Eliminating periods where calibration gas is in the ambient dataset

· Identifying periods where instruments are warming-up after a power cut

· Identification of anomalies due to mains power spikes

· Correcting problems with the date and time stamp

· Observations made during the sites visits and services

The identification of data anomalies, the proper understanding of the effects and the application of appropriate corrections requires expertise gained over many years of operational experience. Instruments and infrastructure can fail in numerous ways that significantly and visually affect the quality of the measurements. There are rarely simple faults that can be discovered by computer algorithms or can be understood without previous experience.

The PM_{10} concentrations require scaling into Gravimetric Equivalent concentration units by use of the Volatile Correction Model (VCM) http://www.volatile-correction-model.info or by corrections published by Defra https://uk-air.defra.gov.uk/networks/monitoring-methods?view=mcerts-scheme depending on the measurement technique.

QC Audits

Ricardo Energy & Environment carry out annual audits to rigorously evaluate analysers to obtain an assessment of performance level. This information, in conjunction with the full analyser data set and calibration and service records, help ensure data quality specifications have been met during the preceding period. Additionally, an assessment of the station calibration cylinder concentrations provides an indication that the cylinder concentrations remain stable and therefore suitable for data scaling purposes.

The following describes the audit process:-

1 Oxides of Nitrogen

1.1 Analyser Response Factors

A stable "intercalibration standard", validated against transfer standards, is transported to each site and is sampled by the analyser.

The analyser also samples from a cylinder containing certified metrology grade zero air, or catalytic scrubbers of known efficiency.

The analyser factor quoted is the response to the intercalibration standard, expressed in $nmol.mol^{-1}.logged\ unit^{-1}$, with the zero point being the response to zero air.

For oxides of nitrogen analysers, the NO_x and NO channel response factors are derived from an NO in nitrogen cylinder.

1.2 Analyser Linearity

To determine analyser linearity, a series of amount fractions are produced (using dynamic dilution techniques) covering the analyser range. The analyser output is noted for each of these amount fractions. A linear regression is then carried out, relating analyser output to the dilution factor at each point. The linearity error is defined as the maximum residual of the regression slope.

1.3 Analyser noise levels.

This is defined here as the standard error of ten successive spot readings of analyser output when fully stabilised on zero (zero noise) or span (span noise) amount fraction.

1.4 NO_x analyser Converter Efficiency

NO_2 to NO Converter efficiency is determined using gas point titration as follows:

A stable amount fraction of NO is produced, (by two stage dynamic dilution) and the analyser outputs, NO_x and NO, are noted after a suitable stabilisation period.

Ozone is added to the sample, converting some NO to NO_2, note however, the total NO_x in the sample remains constant. Again, following appropriate stabilisation times, the NO_x and NO outputs are noted.

Converter (in)efficiency is defined as the change in scaled NO_x signal as a percentage ratio of the change in the scaled NO signal.

1.5 Estimation of Site Cylinder Amount fractions

The site cylinder amount fractions are evaluated by sampling from the site cylinder and using the analyser response factors, to derive their amount fraction.

2 Particle Analysers.

2.1 Analyser Flow Rates

Flow rates are measured by calibrated flow audit measurement systems. A leak check is also carried out.

2.2 Analyser Calibration Constants

TEOM Analyser calibration constants are measured by consideration of the change in frequency induced by placing pre-weighed masses on the analyser sensors.

PM_{10} and $PM_{2.5}$ Monitoring Adjustment

PM_{10} Data from the FDMS and the BAMs used in MBC, does not require the application of a correction factor.

Automatic Monitoring Annualisation

The automatic monitoring of PM_{10}, $PM_{2.5}$ and NO_2 within Maidstone Borough recorded data capture of greater than 75% in 2023 In Upper Stone Street the data capture was (98.7%, for $PM_{2.5}$, 99.3% for PM_{10} and 99.5% NO_2 99% and in Detling the data capture was 86.3% for PM10 and for 97.4% for NO_2 therefore annualisation of the monitoring data was not required.

NO_2 Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO_2 concentration at the nearest location relevant for exposure has been estimated using the NO_2 fall-off with distance calculator available on the LAQM Support website. Where appropriate, automatic annual mean NO_2 concentrations corrected for distance are presented in Table A.3.

Appendix D: Map(s) of Monitoring Locations and AQMAs

Figure D.1 – Map of all Non-Automatic Monitoring Sites

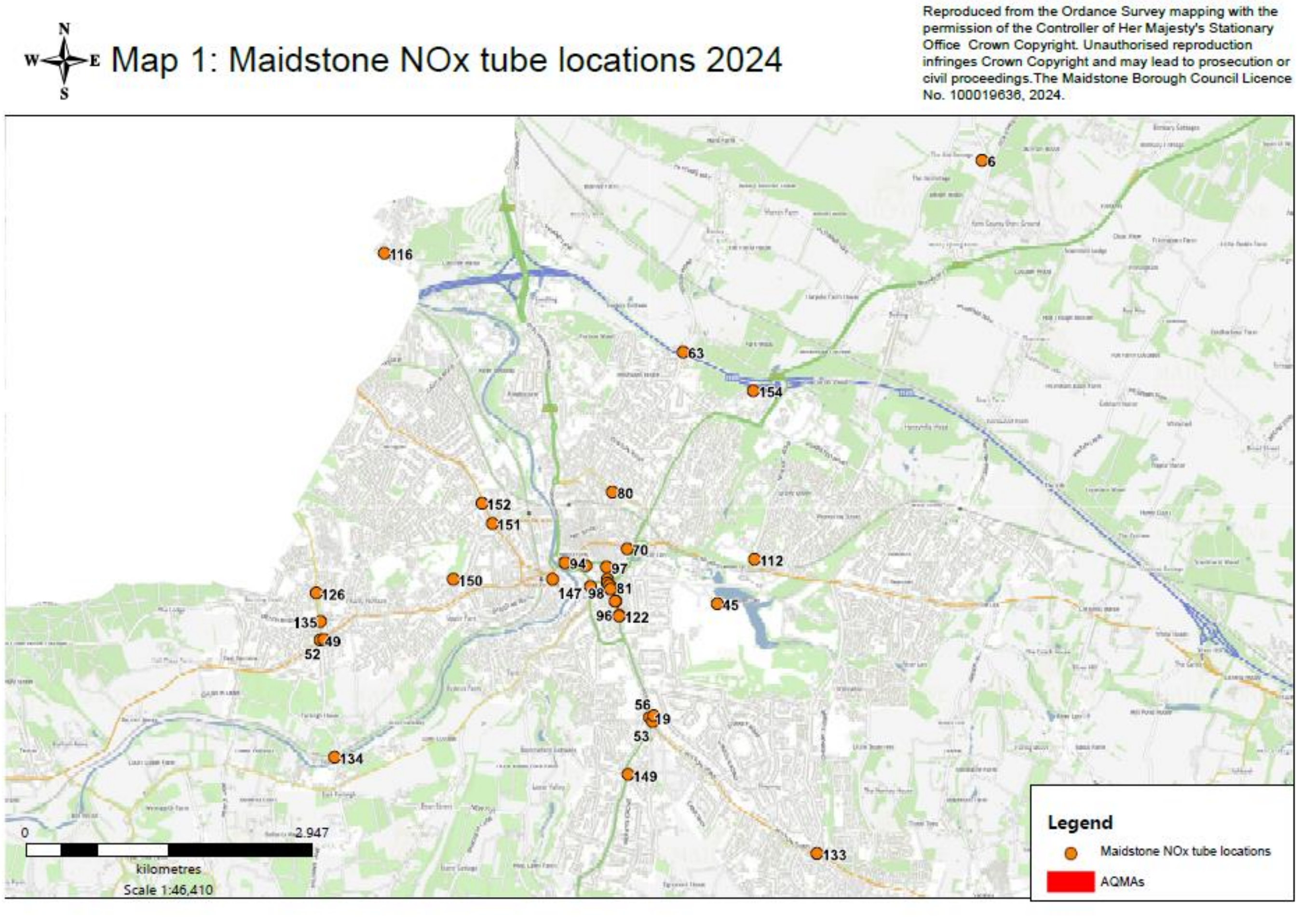


Figure D.2 – Map of Non-Automatic Monitoring Site Maid 6

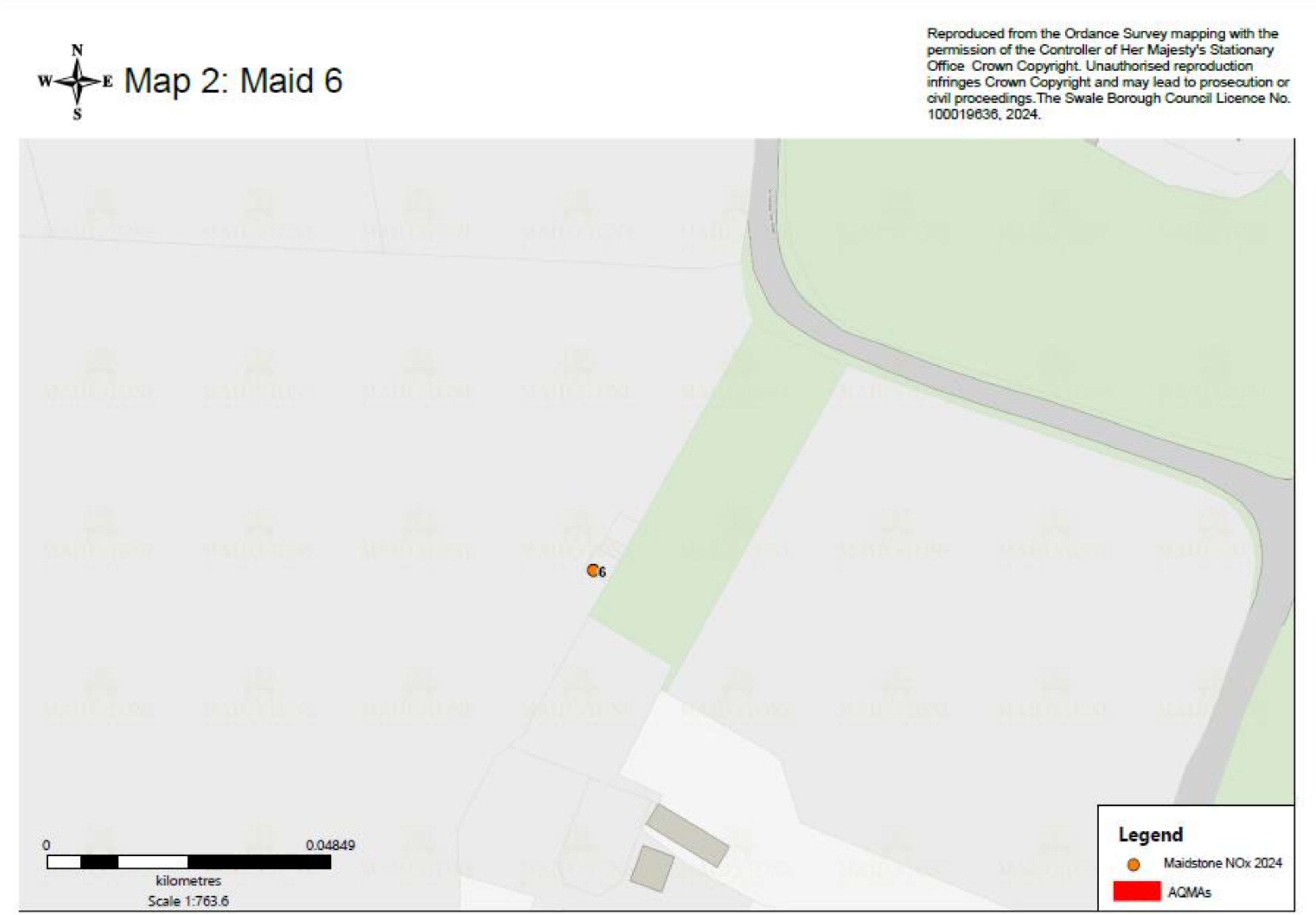


Figure D.3 – Map of Non-Automatic Monitoring Site Maid116

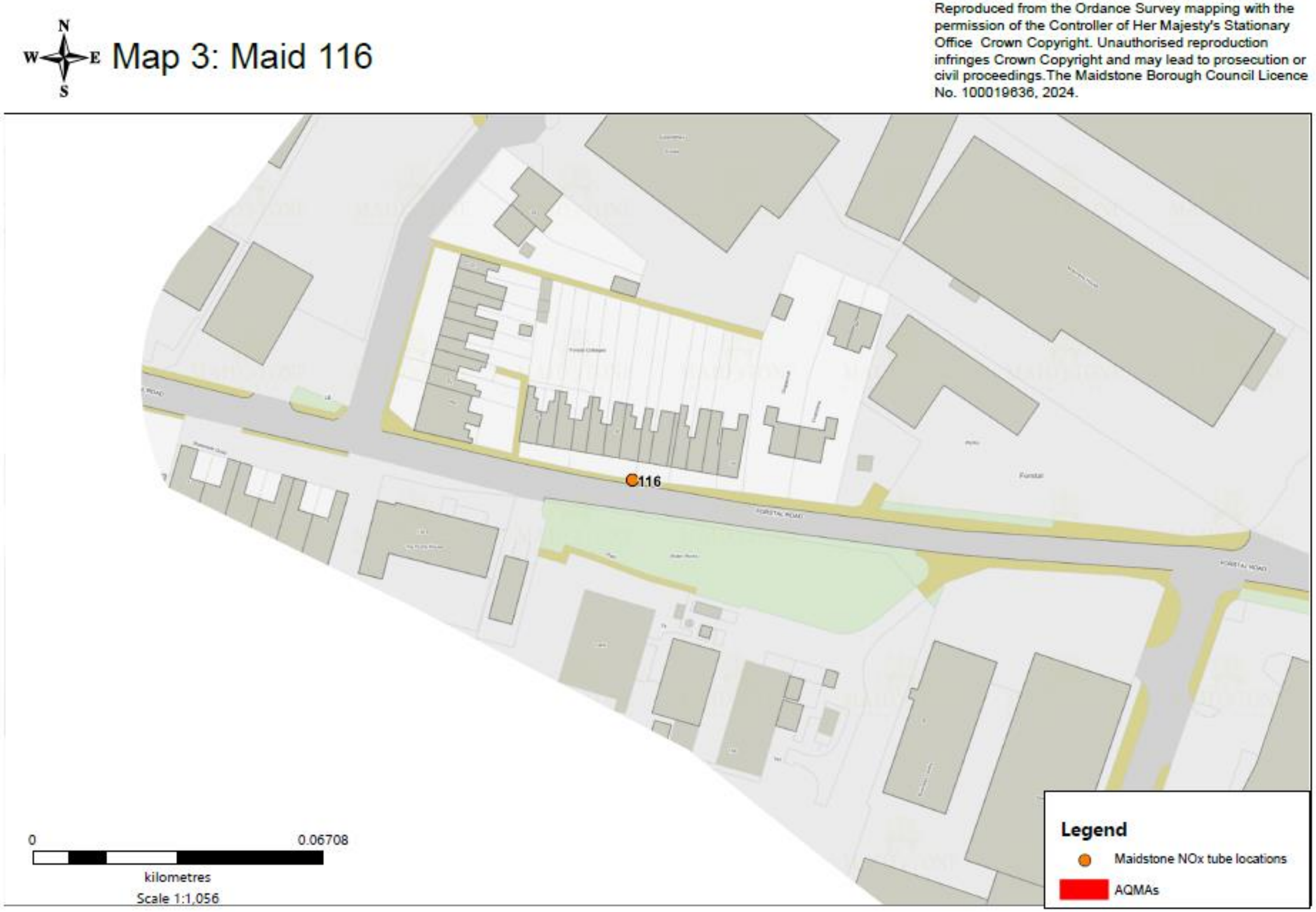


Figure D.4 – Map of Non-Automatic Monitoring Site Maid63 and Maid154

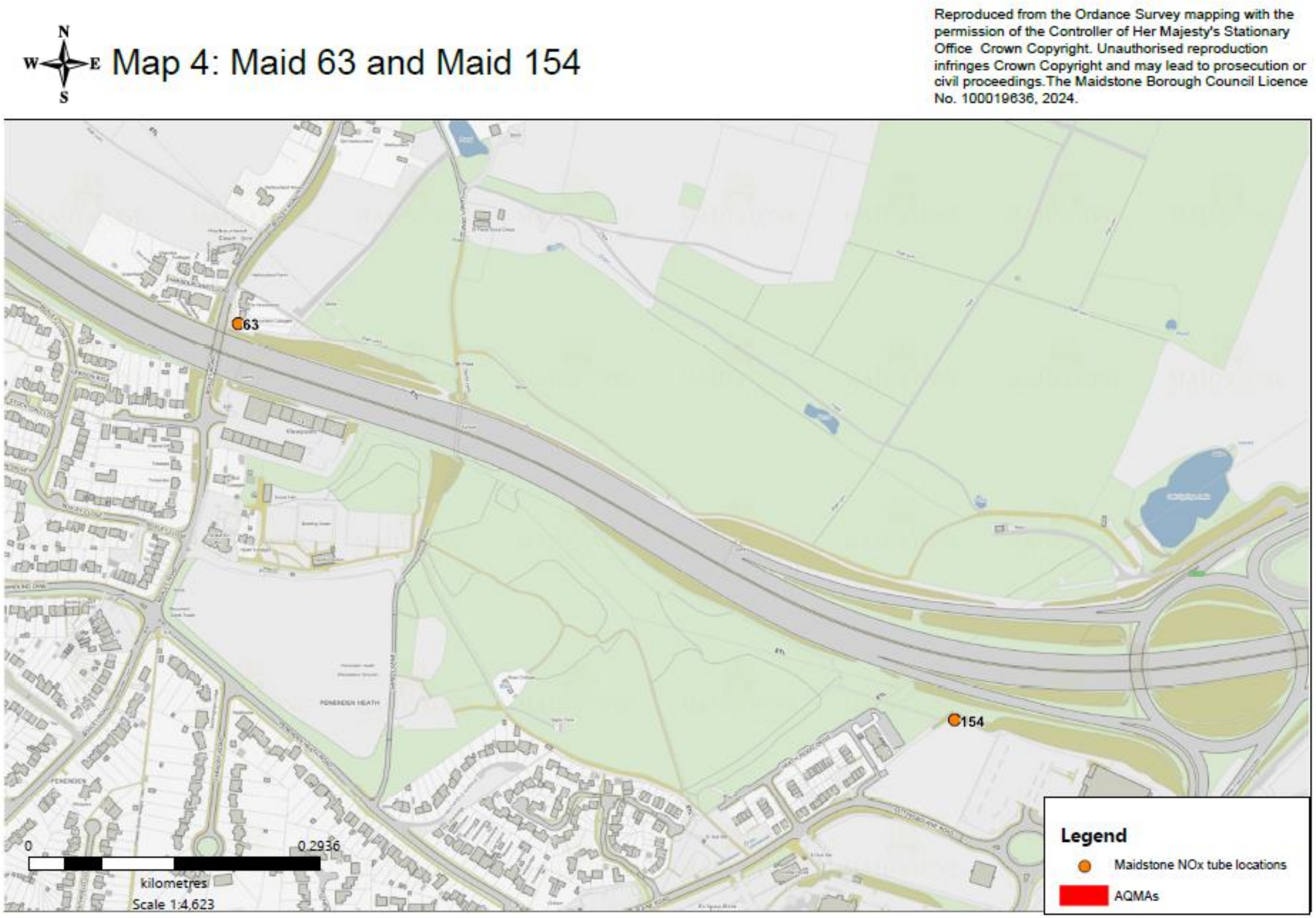


Figure D.5 – Map of Non-Automatic Monitoring Site Maid45 and Maid112

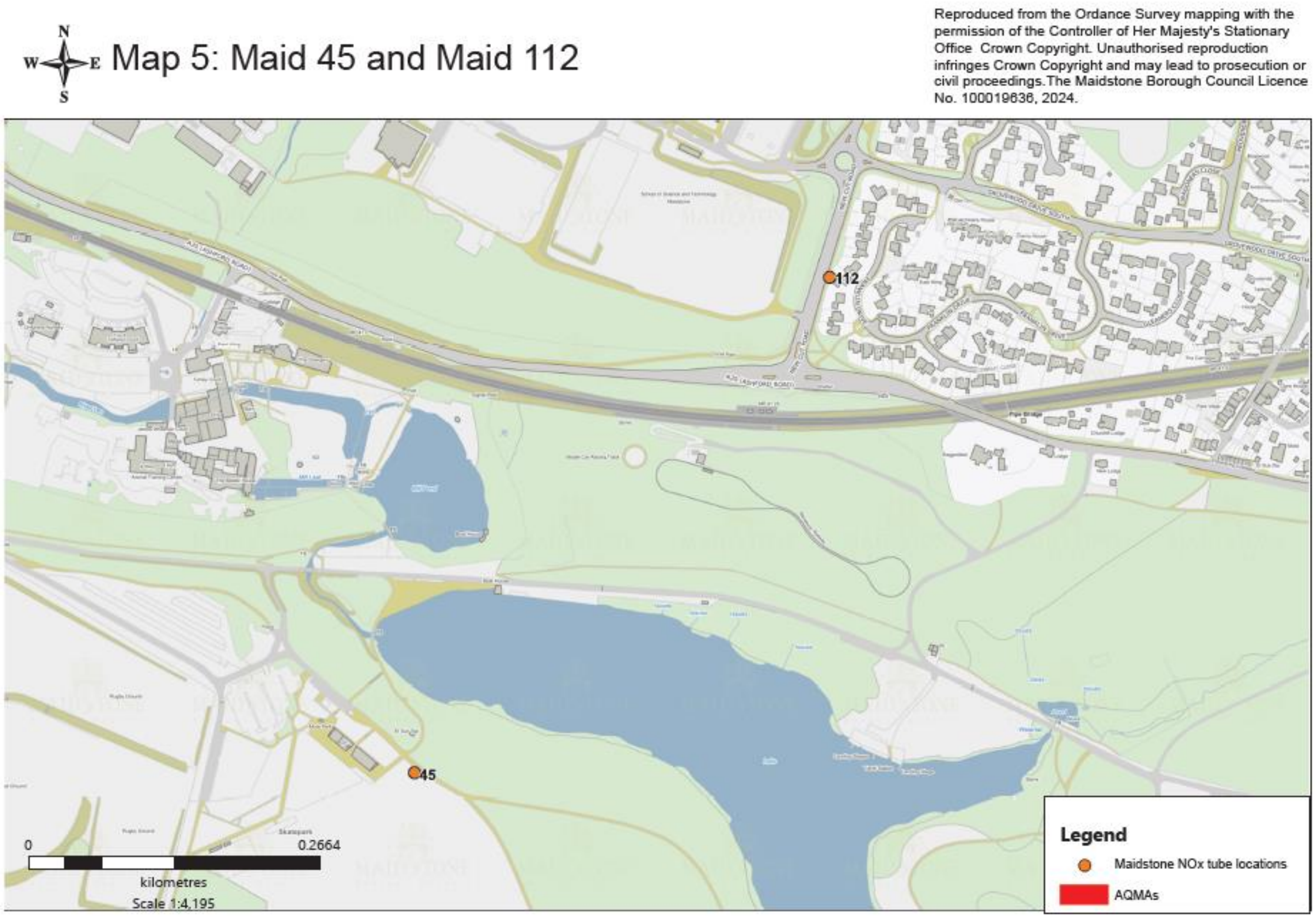


Figure D.6 – Map of Non-Automatic Monitoring Site Maid133

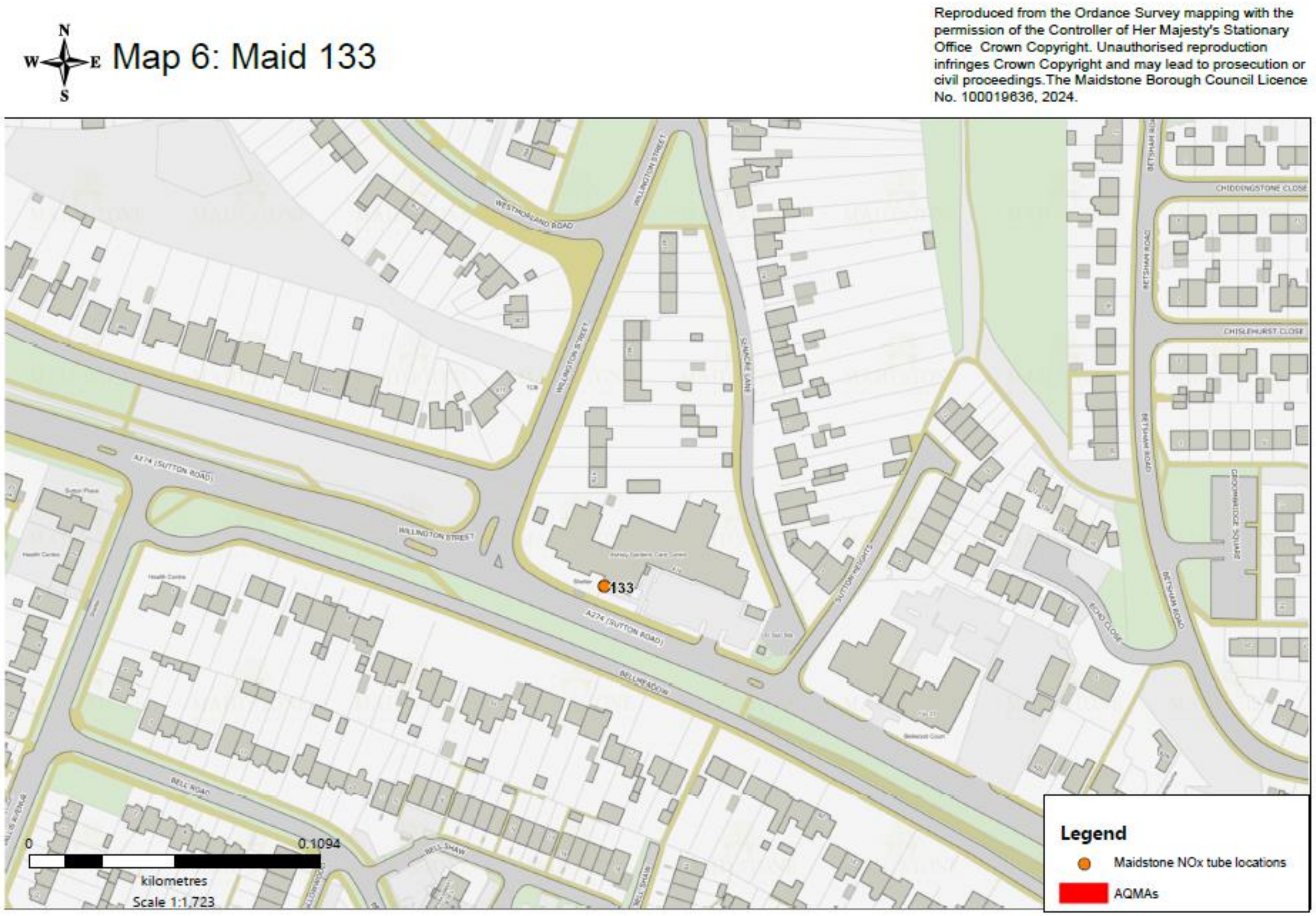


Figure D.7 – Map of Non-Automatic Monitoring Sites for Maid149, Maid53, Maid19, and Maid56

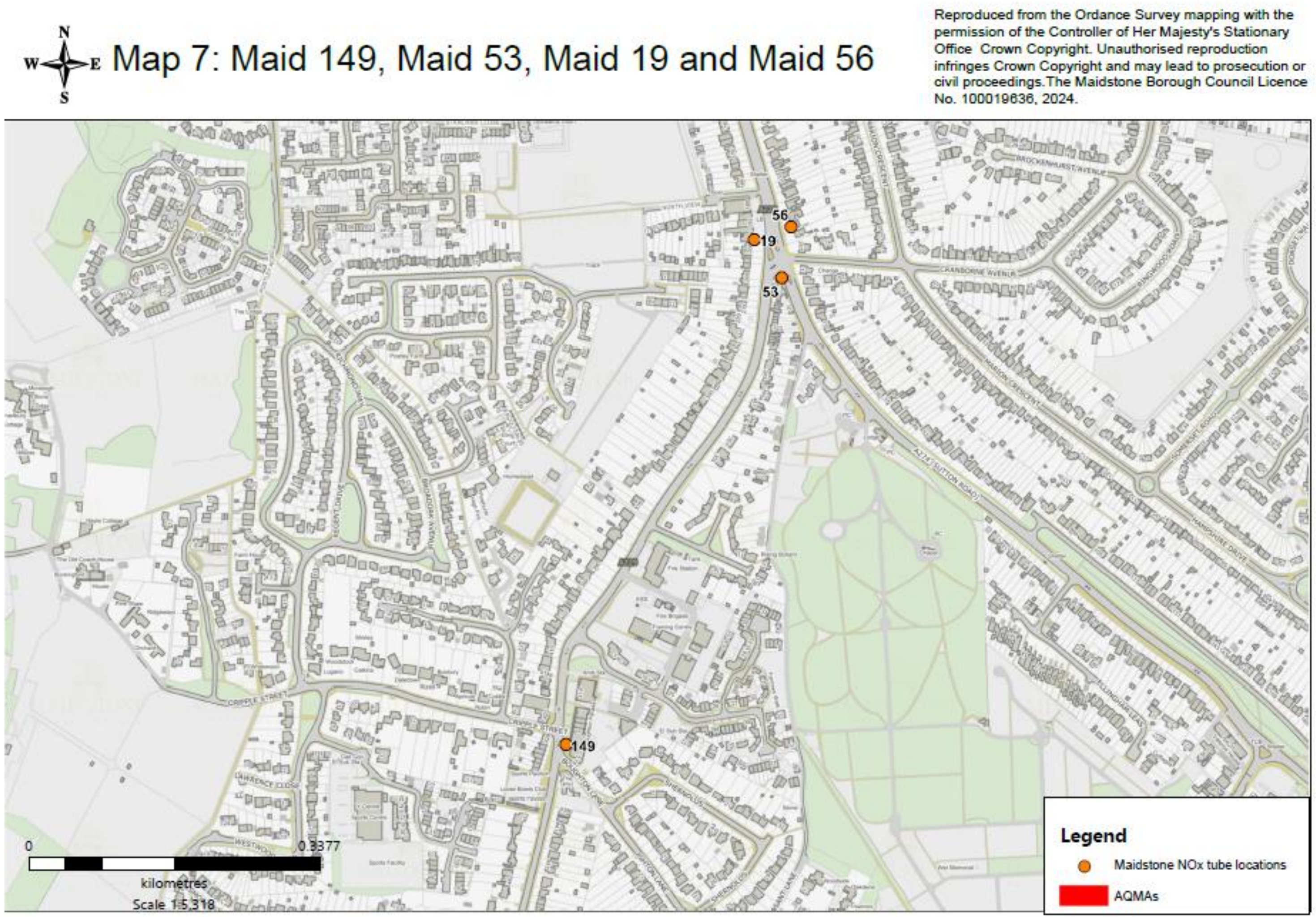


Figure D.8 – Map of Non-Automatic Monitoring Site for Maid134

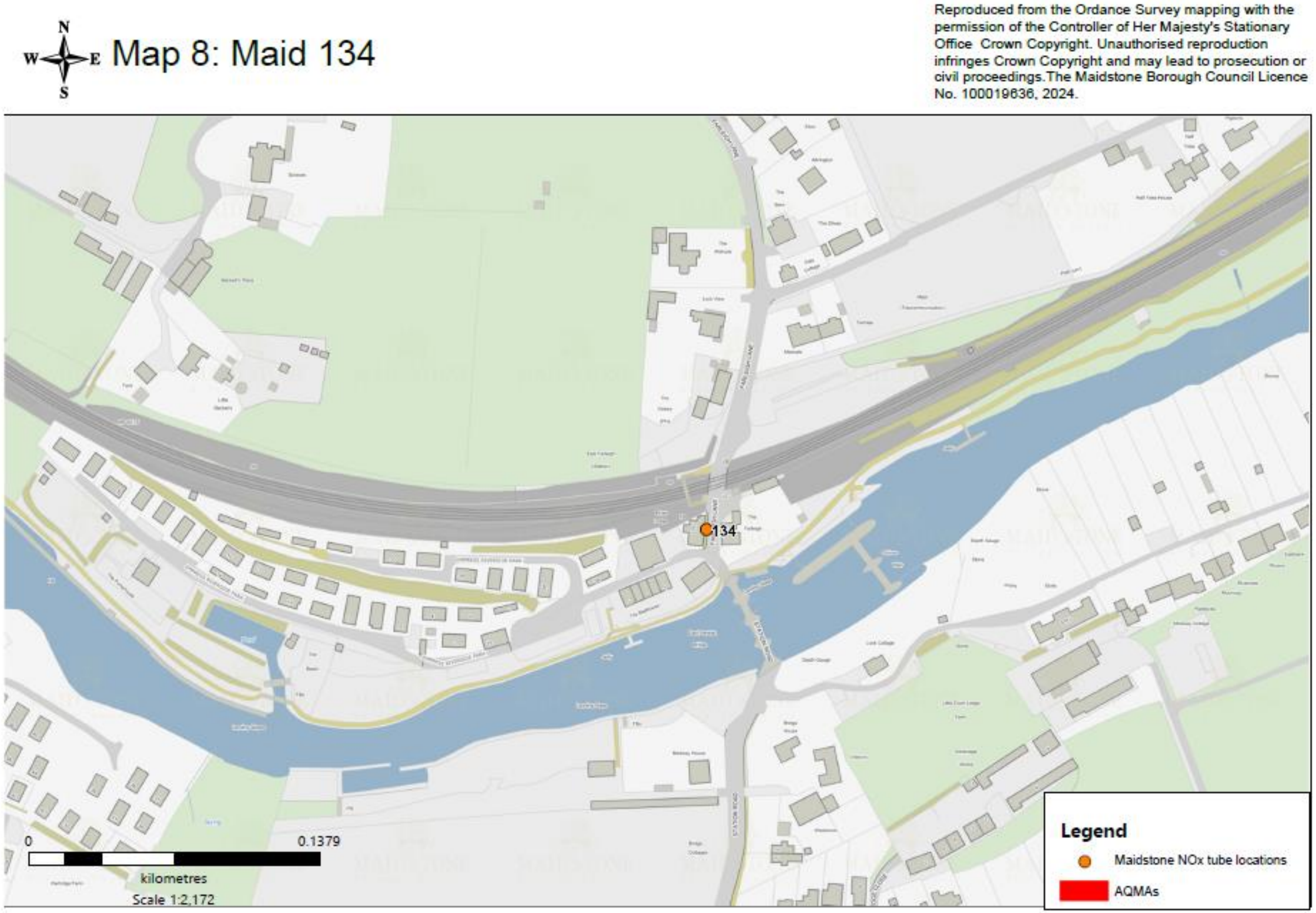


Figure D.9 – Map of Non-Automatic Monitoring Sites Maid126, Maid135, Maid49 and Maid52

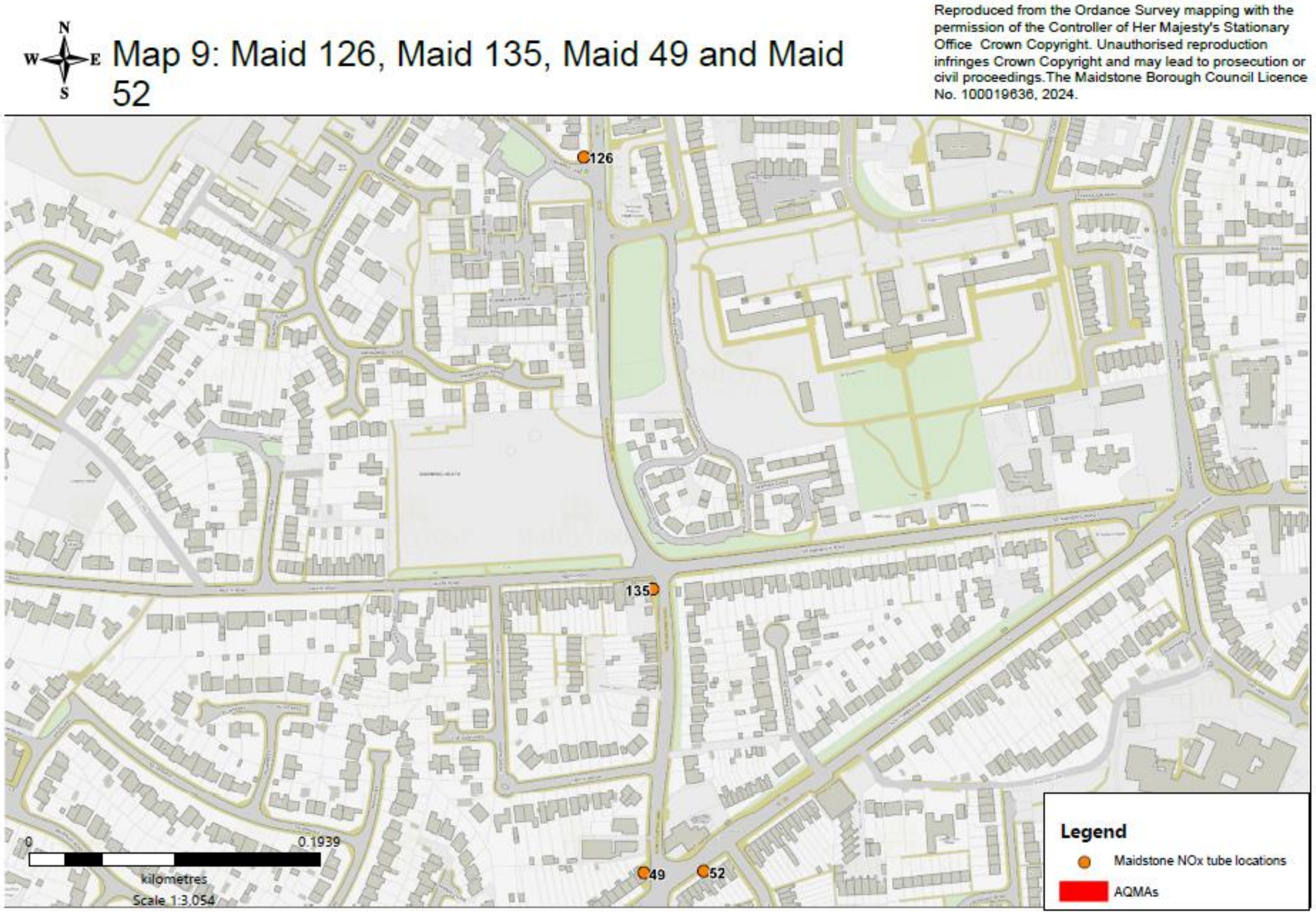


Figure D.10 – Map of Non-Automatic Monitoring Sites Maid152, Maid151, Maid150, Maid147, Maid94, Maid153 and Maid145

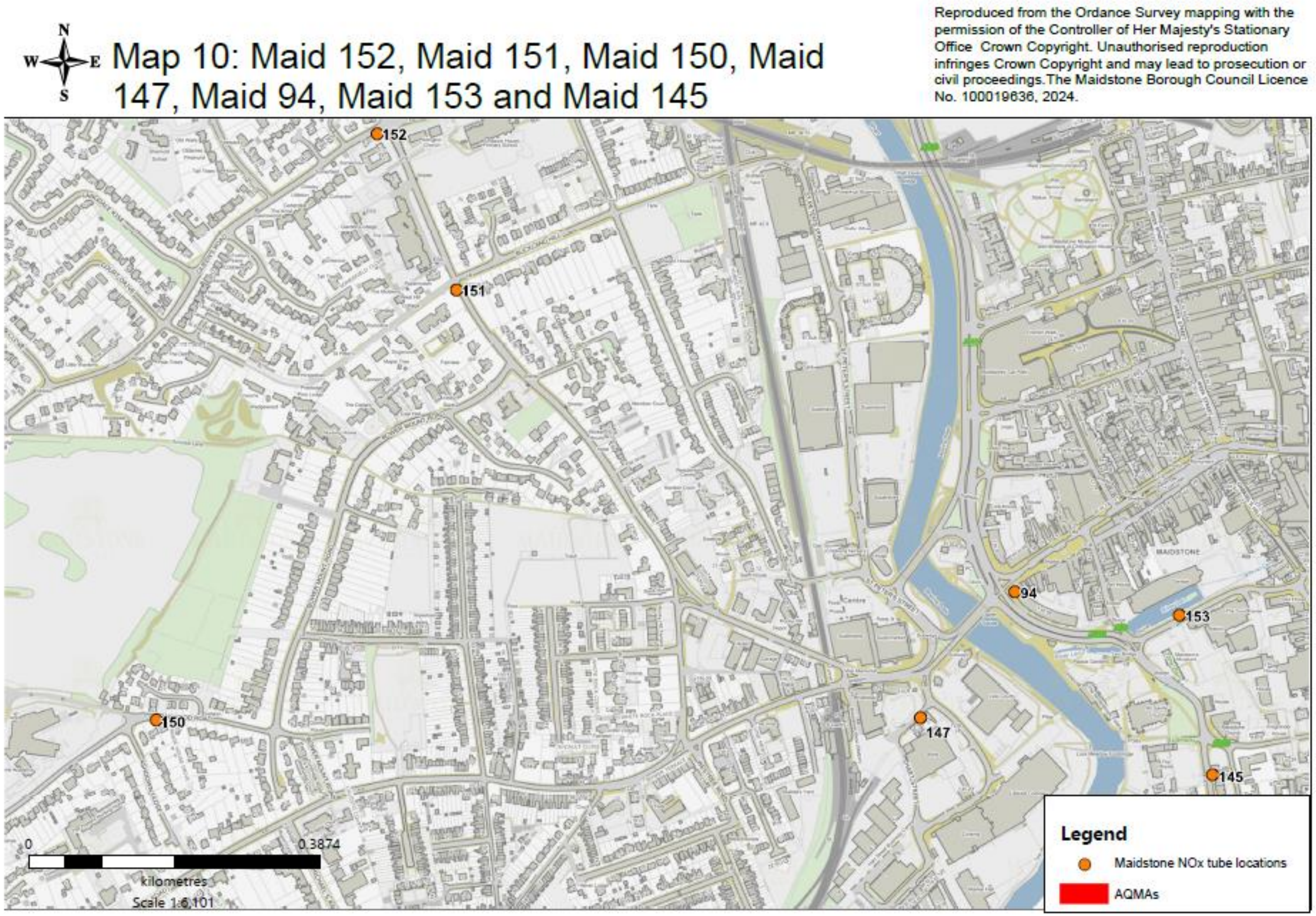


Figure D.11 – Map of Non-Automatic Monitoring Sites at Maid98, Maid127, Maid142, Maid81, Maid143, Maid128, Maid96, Maid123, and Maid122

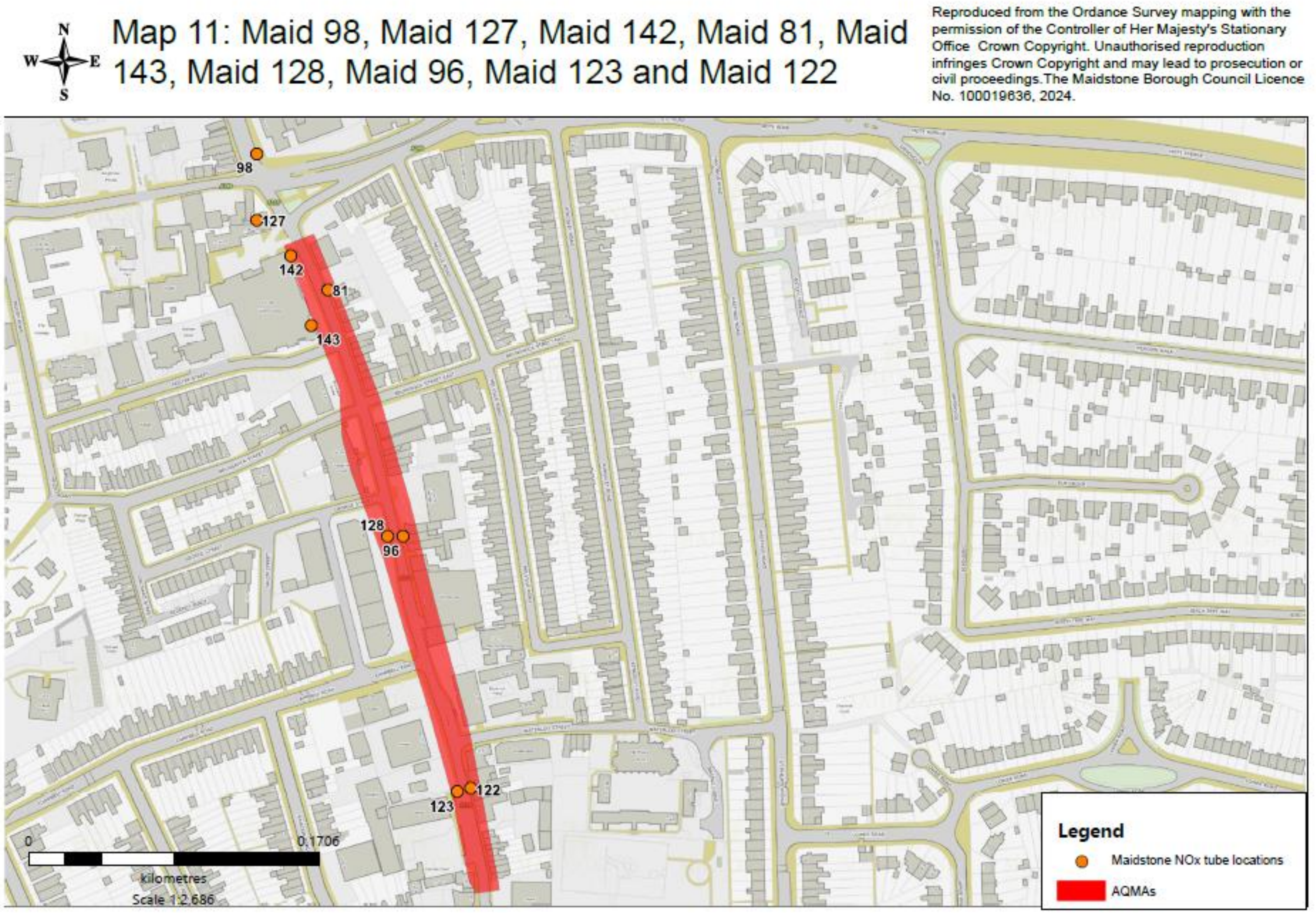


Figure D.12 – Map of Non-Automatic Monitoring Sites Maid97 and Maid70

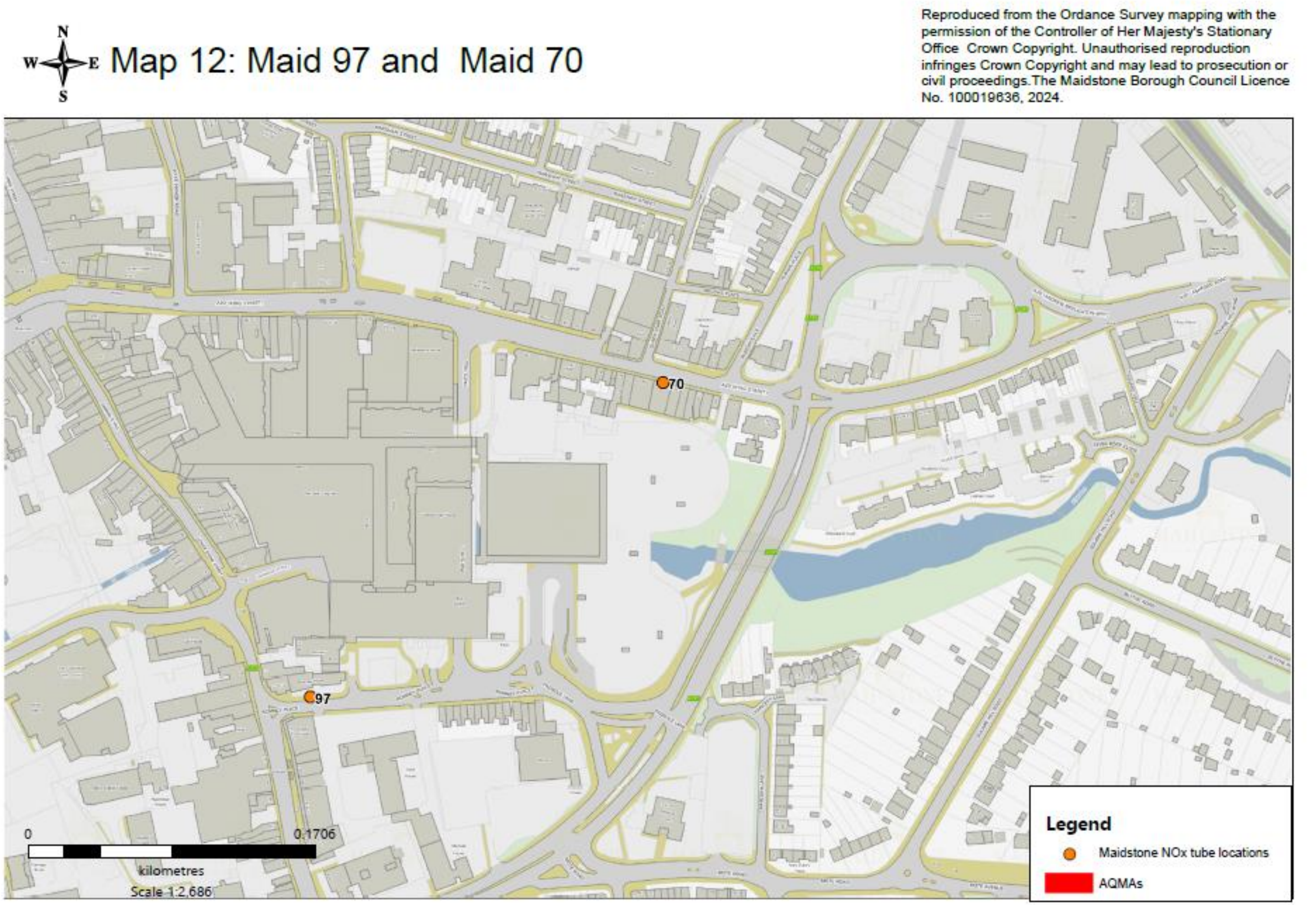
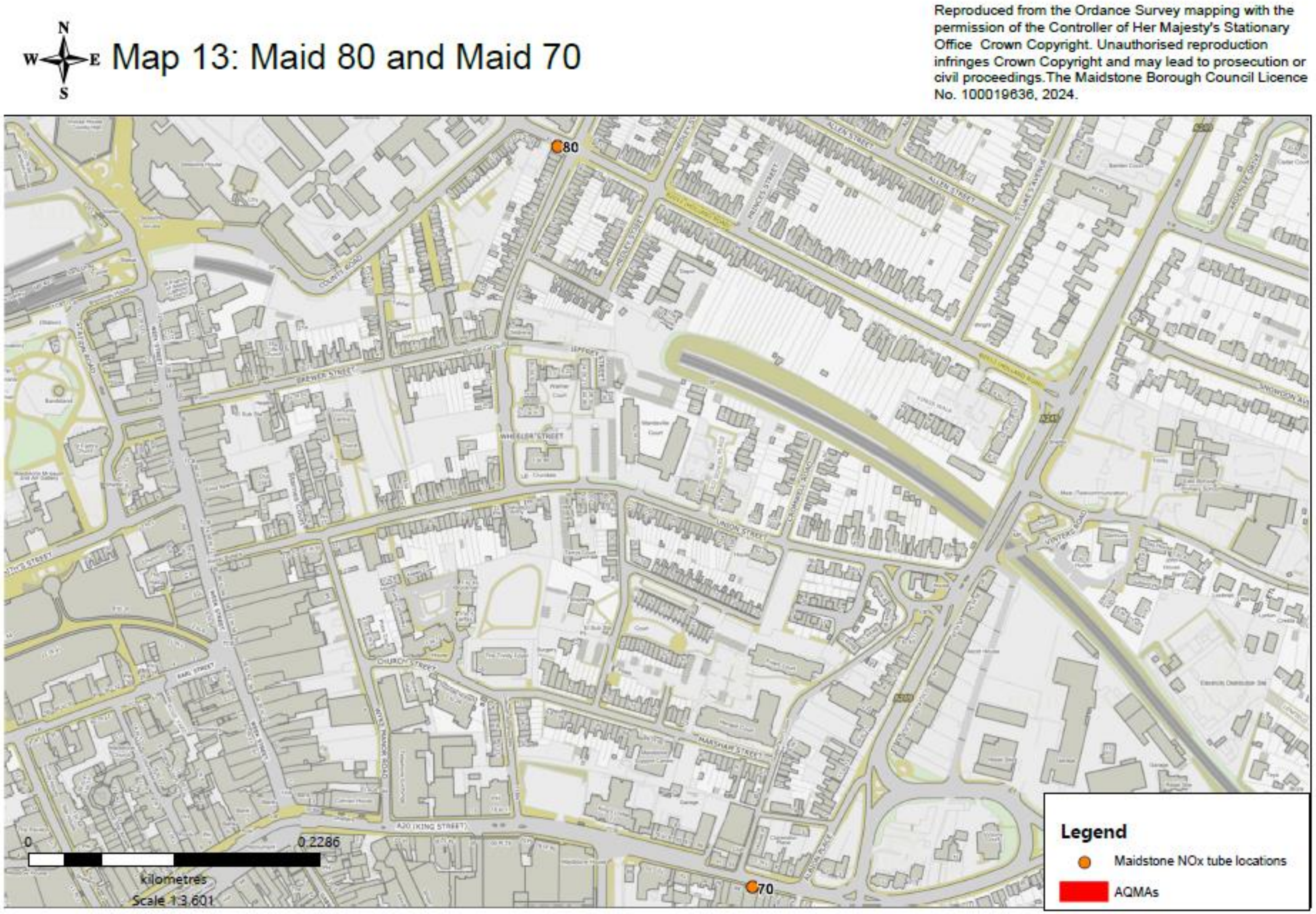


Figure D.13 – Map of Non-Automatic Monitoring Sites Maid80 and Maid70



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England[7]

Pollutant	Air Quality Objective: Concentration	Air Quality Objective: Measured as
Nitrogen Dioxide (NO_2)	200µg/m³ not to be exceeded more than 18 times a year	1-hour mean
Nitrogen Dioxide (NO_2)	40µg/m³	Annual mean
Particulate Matter (PM_{10})	50µg/m³, not to be exceeded more than 35 times a year	24-hour mean
Particulate Matter (PM_{10})	40µg/m³	Annual mean
Sulphur Dioxide (SO_2)	350µg/m³, not to be exceeded more than 24 times a year	1-hour mean
Sulphur Dioxide (SO_2)	125µg/m³, not to be exceeded more than 3 times a year	24-hour mean
Sulphur Dioxide (SO_2)	266µg/m³, not to be exceeded more than 35 times a year	15-minute mean

[7] The units are in microgrammes of pollutant per cubic metre of air (µg/m³).

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values’
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by National Highways
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur Dioxide

References

- Local Air Quality Management Technical Guidance LAQM.TG22. August 2022. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- Local Air Quality Management Policy Guidance LAQM.PG22. August 2022. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- Chemical hazards and poisons report: Issue 28. June 2022. Published by UK Health Security Agency
- Air Quality Strategy – Framework for Local Authority Delivery. August 2023. Published by Defra.
- Kent and Medway Air Quality Partnership (2011) *Air Quality and Planning Technical Guidance (updated 2016)*
- National Diffusion Tube Bias Adjustment Spreadsheet, version 03/24 published in March 2024.
- Maidstone Borough Council Upper Stone Street Air Quality Action Plan – September 2023
- http://www.phoutcomes.info/public-health-outcomes-framework#page/0/gid/1000043/pat/6/par/E12000008/ati/101/are/E07000114